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SIERRA LEONE.

Annual Report

OF THE

Department of Agriculture

For the Year 1930.

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DEPARTMENT OF AGRICULTURE.

Report for 1930.

PART I.—AGRICULTURAL ADMINISTRATION AND PROGRESS.

STAFF.

1. At the beginning of the year the appointment of Assistant Agricultural Chemist was abolished, and a new appointment of Assistant Director made. For financial reasons a sixth Provincial Superintendent of Agriculture (now Agricultural Officer) was retrenched before the appointment was filled. One of these five officers has to be in charge of Njala Agricultural Station, which leaves four only for the basic and most important work of the department: direct instruction and demonstration for the assistance and improvement of native agriculture.

2. After the arrival of the new Director, in May, a re-arrangement within the department was made, as the part of it called Research Division had never functioned as such, the necessary contact with and team-work for the agricultural needs of native farmers never having existed; and because financial conditions did not permit of academic work in the place of work for such needs that had long failed to receive sufficient attention. In this re-arrangement the department was reconstituted as one organism whose chief function is instruction and demonstration, the needs of these being served closely by the advisory work, in economics, entomology and mycology at present, under guidance from headquarters. In furtherance of this plan the old Division of Inspection of Plants and Produce was made part of the new organism: so that produce improvement is now a mutual work of Agricultural Officers and the Inspector of Plants and Produce, acting in close co-operation.

FINANCE.

3. The total provision for the ordinary work of the department decreased from £29,111 to £27,793 (allowing for the substitution of an Assistant Director for Assistant Chemist): of the latter sum £15,308 was for Personal Emoluments and £12,485 for Other Charges. The total provision for salaries of the European Administrative, Research and Field Staffs was £7,247, the respective percentages of this being 28, 32 and 40: figures

that in themselves show the urgent need for reform in the constitution of the department. The scientific staff provided at present (besides the Chemist) comprises that for plant protection (Entomologist and Mycologist); but a plant breeder is necessary for rice, the mainstay of the country, and more field officers for all the crops: a strengthening of the department that, it is hoped, it will soon be possible to begin to effect with little initial change in the total expenditure.

4. The expenditure approved under Surplus Balances for experiment and demonstration for the encouragement of plantation agriculture was £11,495, of which £8,069 was for the oil-palm: £7,500 for Masanki Oil-palm Plantation and £569 for palm improvement plots; and £3,426 was for bananas and citrus at Newton Experimental Fruit Farm. Of this total of £11,495, £3,000 was provided by the Empire Marketing Board for the work with oil-palms and fruits, and £2,000 by one of the principal produce firms, for that with oil-palms, making the proportion from contributions nearly one-half.

GENERAL AGRICULTURAL ASSISTANCE.

5. It is not possible to describe at this stage of reporting the plans and procedure that are being devised for giving agricultural assistance on definite lines, except to say that the provision of an agricultural library for the department was begun: work that was usefully expedited by the valuable assistance given for it by Mrs. J. V. R. Brown. All that the present report can deal with are the details that are presented in the succeeding section.

DETAILS OF ASSISTANCE AND PROGRESS.

6. At the present stage it has been thought best to summarize assistance and progress in regard to native agriculture that has been given in the past; and useful special efforts have been made, in providing the summary reviews from which the details below are taken, by the following Agricultural Officers: Mr. R. R. Glanville for the Northern Province, Mr. J. V. R. Brown and Mr. P. J. Moss for the Central Province, and Mr. J. W. D. Fisher for the Southern Province. These details serve to show that a considerable amount of work has been done, often remaining unrecorded, that gives encouragement for future progress of the same kind.

Northern Province.

7. Since 1925, Makump has been the headquarters of the Agricultural Officer in the Northern Province and has also served as a demonstration farm and a distributing centre for seeds and planting material. A summary of its chief work is as follows:—

1925.—Cacao nursery established for supplying seedlings for planting in the Bombali District.

1926.—Station cleared, nurseries extended and $\frac{3}{4}$-acre of wild oil-palms thinned out for demonstration.

1927.—Small demonstration plots of kola and stenophylla and Liberian coffee were established.

1928.—The station was extended by the addition of 20 acres of which 8 were cleared and stumped during this year. Plots of Nigerian oil-palm, canephora coffee, cacao and sisal, and in addition 4 acres of food crops, including yams, cassava, sweet potatoes, ground-nuts and fundi (*Digitaria*) were established, and nursery work was maintained.

1929.—Another 3 acres were cleared and plots of stenophylla coffee and kola were established. Nursery work was extended.

1930.—Plantations and nurseries were maintained but the area under food crops was reduced subsequent to the transfer of headquarters to Njala. The nursery is well stocked with cacao, canephora and stenophylla coffee, and Nigerian oil-palm. (A list of the farm plots is given below.)

8. The nursery work and the raising of planting material of food crops for distribution have been outstanding features of the station. Seed and seedlings of Nigerian oil-palm, cacao and coffee have been distributed free but farm produce has been sold; and this applies also to seedlings of kola, coconuts and breadfruit, for which the demand has always been greater than the supply.

9. The distribution of planting material has been as follows:—

——	1926.	1927.	1928.	1929.	1930.	Total.	——
Cacao	4,014	3,830	2,876	2,867	1,821	15,408	seedlings
Cacao	1,070	990	807	1,200	100	4,167	pods
Coffee	—	220	2,823	2,740	1,105	8,888	seedlings
Kola	—	119	56	290	265	730	„
Nigerian oil-palm	—	82	3,604	798	304	4,768	„
Coconut	—	—	—	—	124	124	„
Breadfruit	—	23	—	74	35	132	„
Avocado	—	—	—	23	12	35	„
Lime	—	520	—	232	10	762	„
Chinese-yam	—	—	60	50	731	841	lb.
Yellow-yam	—	—	—	—	998	998	seedlings

In addition to the above there were distributed large quantities of cassava cuttings (improved varieties), potato vines, banana and plantain suckers, vegetables (seeds and plants) and seeds of maize, castor, cassia, velvet bean, pigeon pea and some others.

10. The plots established were as follows:—

Plot Number.	Crop.	Area acres.	Year.	Remarks.
1	Cacao ...	1	1910 (approx.)	Made by Missions.
2	Liberian coffee ...	$\frac{1}{5}$	1927	Bearing.
4	Kola ...	1	1927	Planted under natural shade.
5	Kawei oil-palm ...	$\frac{3}{4}$	1927	Wild palm stand. Records of yields kept.
6	Stenophylla coffee ...	$\frac{1}{5}$	1927	Bearing.
7	Nigerian oil-palm ...	1	1927	Beginning to bear.
9	Canephora coffee ...	—	1928	Bearing. Canary banana as shade.
10	Annual crops	1	—	
11	Annual crops	1	—	
12	Annual crops	1	—	
13	Cacao ...	$\frac{3}{4}$	1928	Plantain shade.
14	Cōconut ...	$\frac{1}{4}$	1930	
15	Sisal ...	$\frac{1}{4}$	1928	
16	Yams ...	$\frac{1}{4}$	—	
17	Kola ...	$\frac{3}{4}$	1929	
18	Stenophylla coffee ...	$\frac{3}{4}$	1929	

11. In 1919, 10 acres of low-lying, but not swampy, alluvial land were cleared in the orchard bush on the side of the river opposite to Batkanu, Karene District. Plots of kola, coffee, lime, rubber and sisal were made but apparently with no success as now no trace of them remains. Soil conditions proved unsuitable and in addition much damage was done by antelope and grass fires. In 1922, a small plot of oil-palm (local variety) was laid out, which is now bearing.

12. In 1923, plots of sisal and stenophylla coffee were made on the lateritic soil near the District Commissioner's quarters, and still exist. Chinese yams were also grown and "seed" distributed with successful results.

13. In 1929, a small nursery was made and small quantities of coffee, kola and cacao seedlings were distributed to local applicants.

14. A small nursery was made at Port Loko in 1929, and since then the following planting material has been distributed:—

Kola	402	seedlings
Coffee	648	„
Cacao	908	„
Orange	68	„
Sweet sop ...	72	„
Avocado	10	„
Nigerian oil-palm ...	76	„
Chinese yam ...	200	lb.
Cassava	large quantity	

These figures represent the supply and not the demand, for there is a very keen demand for planting material in this area causing need for a much larger nursery.

15. In 1927, 5,000 kola seedlings were raised and distributed at Kabala (Koinadugu) and at the moment stenophylla coffee and Nigerian oil-palm seedlings are being raised for distribution in 1931.

16. In 1925–26 there were farms at Malaforea (Koinadugu) and Binkolo (Bombali) and experiments were carried out with cotton and, to a less extent, ginger and castor beans.

17. Since 1925, farmers have been encouraged to grow Cacao in suitable places, chiefly in the middle and south of the Bombali District from planting material from Makump, the following being the plantations made to date under supervision:—

District.	Plantations.	Seedlings.
Bombali	152	36,551
Port Loko	13	3,965
Koinadugu	20	3,022
Karene	5	233
Total ...	190	43,771

Mortality is estimated at about 40 per cent., so that probably some 26,000 plants are now established in the farms. The prospects seem moderately good in Bombali, Port Loko and Southern Koinadugu, but elsewhere conditions do not appear to be as suitable. Even in the areas named, extension will greatly depend on the price offered for cacao during the next few years.

18. Since 1927, a small number of plantations of COFFEE has been made in each district, the number of plants in the number of plantations (in brackets) being as follows:—

——	Stenophylla.	Canephora.	Robusta.	Liberian.
Bombali ...	890 (9)	908 (9)	—	197 (2)
Port Loko ...	482 (4)	—	176 (5)	—
Koinadugu ...	422 (3)	422 (3)	50 (1)	—
Karene ...	100 (2)	—	292 (3)	—
Total ...	1,894 (18)	1,330 (12)	518 (9)	197 (2)

Coffee is a new crop in the Northern Province, but in the Bombali and Port Loko districts the people are exhibiting a rapidly increasing interest in it, and there is no doubt that with a little encouragement they will soon start to plant extensively. That there are not more plantations is chiefly due to caution in encouragement for coffee until it is known with some certainty which varieties may be depended upon to give successful results.

19. Attempts to establish exotic COTTON in the Northern Province failed through unsuitability of climate and lack of trustworthy assistance in supervision.

20. In 1926, the Forestry Division of the Lands and Forests Department made a 5-acre plot (abandoned in 1928) at Makene to demonstrate any value that may be attached to thinning out wild OIL-PALM stands and subsequently keeping the palms clean and the undergrowth cut back; a small $\frac{3}{4}$-acre plot was also thinned at Makump. This demonstration is of little value as propaganda, as the native is not interested in it. The establishment of plantations of a better variety of palm does however appeal to farmers, and in 1927, the offer was made to assist anyone wishing to make a plantation of Nigerian oil-palms. There were immediate requests for such help, and during the years 1928–30, forty plantations have been laid down as follows:—

District.	Plantations.	Palms.
Bombali	29	3,124
Koinadugu	5	631
Port Loko	6	1,116
Total ...	40	4,871

A much larger number of plantations would have been made were it not for the fact that during 1928 and 1929 all Nigerian oil-palm seed was reserved for Masanki.

21. In view of the great importance of KOLA, better planting and cultural methods have been continually advocated for this. There is a large demand for good seedlings; and those raised in

the Government nurseries have always been disposed of without difficulty. In 1927, 5,000 seedlings were raised in baskets at KABALA and in 1928 these were planted with general success in twenty-seven different chiefdoms of KOINADUGU District, any failures being replaced by seedlings raised by the owners working under the supervision of the department.

22. GINGER has never been a commercial crop in the Northern Province, although the plant often occurs untended in the "big bush" near the towns. It is sometimes eaten together with kola; and there is no doubt that the original plants were imported and planted in the various towns, although now they are allowed merely to propagate themselves from year to year. A varying but comparatively small amount is purchased yearly at YONIBANA (Bombali) but most of this comes from the Central Province.

23. In 1924, seed ginger was given to twelve interested chiefs in the BOMBALI District. All these trial plots did well and as the price being paid for ginger was then very high—6*d*. per lb.—there was widespread enthusiasm amongst would-be producers in the Northern Province. To meet the demand the Administrative Department distributed 3 tons of "seed" ginger in 1925 and 17 tons in 1926 in the above district and KOINADUGU, the farms being made under the supervision of this department. The ginger did well, but unfortunately prices fell heavily in 1926 and still further in 1927; and as the fall coincided with the first appearance of Temne ginger on the market, there was great disappointment among the growers, and when the price continued to remain low interest in this crop rapidly came to an end. Judging by the quality of 2 tons of ginger bought for The African and Eastern Trade Corporation in BOMBALI in 1927, it was quite clear that the quality of the Temne ginger was greatly superior to that grown in the Central Province, as it was much cleaner and more carefully prepared in every way.

24. During the years 1925–7 Government encouraged the cultivation of the CASTOR BUSH, particularly in those areas of the KOINADUGU District where oil-palms are either scarce or absent, as well as in BOMBALI. Where the plant was grown in rich soil in the villages the results were good.

25. In 1926–7 Government offered to purchase all available seed at 2*d*. per lb. and 33 cwt. was bought which was distributed for re-sowing. In 1928, it was anticipated that at least 20 tons would be offered for sale; but unfortunately none of the buyers were prepared to pay more than 1*d*. per lb., and this did not attract the producers, so that only a very small quantity exchanged hands. By far the greatest area under the crop was in the north and east of the Province, so far from any market and with such inadequate transport facilities that a price of 1*d*. per lb. is not worth the grower's while.

26. Since 1927, this department, with the keen co-operation of the Administrative officers, has worked hard to increase the area devoted to Swamp Rice; and at the same time has striven to introduce the transplanting method into areas where it is unknown to the people. Verbal encouragement and advice have been given unceasingly, and in addition the following practical measures have been carried out in the various districts.

27. The cultivation of swamp rice has always been popular in Koinadugu but as recently as 1926 virtually no knowledge existed there of the transplanting method. In 1927, six paramount chiefs made large farms of Pa Litoma and Pa Bis, by the transplanting method, under teaching by two Temne instructors, the resulting crops being good and yielding over 1,800 bushels of paddy. In succeeding years 100 bushels of seed from the yield were regularly passed on to fresh participants, and the following table shows the progress of the scheme to date (x and — indicate supervised and unsupervised planting respectively):—

1927.	1928.	1929.	1930.
Simiria	x	x	x
Sambaia ...	x	x	x
Kaliang ...	x	x	x
Nieni	x	—	—
Wuli	x	—	—
Wara Wara ...	x	x	x
	Morifundugu	—	—
	Sengbe	x	x
	Saradugu	—	—
	Court Messengers, Kabala	x	x
		Dembelia Musaia	x
		Dembelia Sinkunia	x
		Sulima	x
		Kabelia	x
			Kakiling
			Fulasaba
			Kalantuba

28. Although most attention is concentrated on the newcomers each year, the others are not neglected and every effort is being made to consolidate in those areas where the transplanting method has already been demonstrated. The farms have been made by chiefdom labour which is in general an undesirable way of encouraging agricultural development; but it is considered that the means were justified in this case, because of the small resources for supervision, the expediency of letting somewhat autocratic chiefs feel that they were first in the field, and the consequent lessened fear of the people that in rice-planting they would be doing something that would cause their chiefs' displeasure.

29. Two trained instructors were detailed for work in KARENE in 1927, and twenty-one farms were made by the transplanting method in ten different chiefdoms, six farms belonging to paramount chiefs and the remainder to ordinary farmers; all seed was supplied by the owners of the farms. In 1928, the work was continued under the supervision of a single instructor and twenty-four farms were made. Good crops were obtained nearly everywhere. Practical instruction was stopped in 1929 but the good effect of the propaganda continues and in certain chiefdoms, particularly SANDA TYENRARON, PENDEMBU and MAFUNDA, gratifying progress continues.

30. Two instructors were engaged in BOMBALI in 1927 and one in 1928 in giving instruction in the transplanting method; and as a result twenty-four farms were made in eight chiefdoms and thirty-seven in nine, in the respective years, the distribution of seed-rice (on payment) being sixty-seven and fifty bushels. This rice, chiefly Pa Litoma, gave excellent results and is now being used extensively; and the results of the teaching continue to be observed.

31. Seed of Indo-China rice was introduced in 1927 by the Forestry Department from French Guinea, said to be "a variety introduced by the French into the Upper Niger Valley for sowing on deeply flooded land, its peculiar characteristic being that it will grow up to 16 feet or more in height and so keep its head above water." (*See* also "Rice," Copeland, pages 259–61.) In the same year trials with this were made at MAKUMP, BATKANU and ROYEL (Little Scarcies), and a yield equivalent to 2,432 lb. per acre of paddy was obtained in the deltaic swamp land at Royel.

32. The experiments were continued for 1928 with good results, and in 1929 it was determined to distribute the seed more widely. In addition to the seed available from the previous year's plots, 10 cwt. of seed was imported from French Guinea and this was given to fourteen farmers in the PORT LOKO District, nine in KARENE and four in BOMBALI. In addition, this department made 1-acre plots in deeply flooded swamps at MAGBAS (Bombali) and MATERBOI (Karene). The yield at Magbas was 1,248 and at Materboi 1, 608 lb. of paddy per acre. The majority of the non-government farms did well: any failure was due to locusts or too-late sowing. This year there are 9 acres under this rice at Materboi alone, where the chief who was much impressed with the results obtained by Government has now carried on for himself. It is considered that the promise of this rice is great, in deltaic and inland swamps whether shallow or deep.

33. It is suitable to place here on record the great success which has attended the distribution of seed of the variety popularly known as Pa D.C. and believed to be "Demarara Creole." In 1914, the Director of Agriculture brought from British Guiana several varieties of rice for trials in Sierra Leone,

which were made for three years with the result that in 1917 it was decided that three varieties, Demarara Creole, 75 V7 and D.75, were worth encouraging. All available seed of the three varieties was distributed to farmers in the tidal rice areas of Port Loko and Kambia. One of them, now believed to be Demarara Creole, did particularly well and was given the name Pa D.C. by the growers. This is now widely grown in the deltaic swamp areas and is becoming more and more popular every year, particularly in the Samu Chiefdom where the short duration of fresh water conditions makes it essential for the farmers to use only a quick-maturing kind. Pa D.C. not only fulfils this condition, but is also a heavy yielder of very good quality which fetches the highest price in the local markets.

34. In 1923, the department purchased Groundnuts from the Gambia and these were distributed by the political officers in Koinadugu and Bombali, where however they failed, probably because they were sown on ridges, in September, badly made by the unaccustomed farmer and washed away in the heavy rains. In 1929, 270 bushels of Conakry groundnuts were distributed in Koinadugu and Bombali, where disease had greatly lessened the previous year's crop; and early planting, in April–May, gave striking success.

35. It is only within comparatively recent years that the Yam has been much grown in the Northern Province; but as a kitchen garden crop it is yearly becoming more popular: the spread of Chinese yams (*Dioscorea esculentus*) is actually a matter for special remark. This was first grown in the Northern Province in or about the year 1923, at the small Experimental Farm at Batkanu, from which it was distributed. It subsequently spread widely through Karene, Port Loko and Kambia, and in these areas there are now few villages in which it is not found.

36. In 1926, ten bushels of Chinese yams were distributed for seed purposes in Bombali and Koinadugu, where they were previously unknown to all but a few, and a plot was made on the Makump farm; from this distribution the results are most promising. Similar promising work has been begun with the yellow yam (*D. cayennensis*).

37. A great extension of the practice of planting the Coconut in the villages as a food crop is anticipated, although it is only quite recently that it has received much attention. In the villages along the Scarcies, Rokel and Port Loko rivers many palms have been planted during the last fifteen years, and of recent years the up-country natives, particularly in Bombali, have been very keen to get seedlings.

38. In 1919, this department opened a sub-station at Yongro in Kafu Bulom (Port Loko) for encouraging Coconut planting on the Bulom Shore; but results at this place have been very poor.

From the Yongro nurseries 2,412 seedlings were distributed during 1920–1 in Kafu Bulom, and where planted in villages are doing well; but the nurseries were abandoned in 1922, chiefly on account of a very severe infestation of scale insects. More recently, 1928–30, an attempt has been made to establish coconuts at YURIKA on the coast of the Loko Masama Chiefdom; but it is too early to say whether the experiment will be a success. In addition to this plantation five small plots of 1–2 acres were made at KUMRABAI and BENKIA, near Port Loko.

39. MAIZE is grown as a kitchen garden crop as well as in the mixed farms throughout the province; and wherever soils are fertile it appears to thrive well: the crops obtained in KOINADUGU are particularly good. There appear to be three local varieties although the strains are often, if not usually, mixed. In 1923, the department imported and distributed small quantities of Bayliss Corn Flake and Wisconsin White Dent, when results were disappointing. In 1926, 100 lb. each of the following from South Africa were distributed: Potchefstroom Pearl, Natal 8-row and Hickory King, in BOMBALI and KOINADUGU; and in most cases excellent crops were obtained; but the strains have disappeared through crossing.

40. A most important crop is CASSAVA; but it has however so far received little attention, either for gaining information about it, or its improvement. There are a great many varieties of it, some of which are definitely superior to others, two of these being "Mayugbe" and "White," little known outside the coastal chiefdoms. During the past few years these varieties have been grown at Makump and largely distributed to local farmers; and in the meantime information on the distribution and use of different kinds has been collected.

41. Since 1926, home buyers have been interested in Sierra Leone RAFFIA and from 1928 onward the department has taken a very active part in the effort to encourage the production of this in the Northern Province. The department has from time to time shown the producers how and when to prepare the fibre; and in 1928 it began to purchase raffia at Makump. The firms at Magburaka then became interested and started to buy, and 25 tons were acquired before the end of the year. Baling was carried out by the department on behalf of several firms, and seventy bales of 200 lb. each were turned out.

42. In April, 1928, three men were taken by the Agricultural Officer to the agricultural farm at Kankan in French Guinea to learn the principles and practice of PLOUGHING. These pupils spent six months at Kankan and on returning with a good practical knowledge, were employed as Instructors in BOMBALI, KARENE, KOINADUGU and PORT LOKO. In 1928, six ploughs were purchased by the administration on behalf of farmers in Batkanu; and in 1929, thirty ploughs and thirty harrows by Government,

most of which have now been sold to farmers in different parts of the province. During 1929, 80 acres of land were cultivated by the plough and during 1930 this area has been doubled. All operations in connexion with the actual ploughing have succeeded almost beyond expectation. Both ploughs and harrows have been a success and there has been little difficulty in training either oxen or ploughmen.

43. Present progress is shown as follows:—

District.		Farmers.	Ploughs.	Harrows.
Karene	...	10	13	12
Bombali	...	5	5	2
Koinadugu	...	8	8	—
Port Loko	...	5	5	4
Total	...	28	31	18

44. The work in the Northern Province has been carried out by Mr. R. R. Glanville, who has shown enterprise in varying it suitably and has made special efforts for collecting information regarding native crops of the kind that is usually ignored and yet is so necessary as part of the basis for agricultural activity.

Central Province.

45. Work began with Swamp Rice in 1925 in Pendembu District, the work being very successful and now firmly established in all districts except Moyamba (where ginger is the chief cash crop).

46. Seed was obtained from the Skarsis region in 1925, and five or six different varieties were planted in demonstration farms; these were lost sight of, but that most in evidence now is usually Pa Litoma. Progress is indicated in the following table (figures are not available for 1930, through interference with the work):—

		Farms.	Seed, bushels.	Harvest, bushels.
1925	...	11	24½	—
1926	...	30	—	—
1927	...	70	132½	6,174
1928	...	159	282	—
1929	...	295	579	—

Measurements of yield made in these farms show on an average a forty-five-fold return.

47. The number of farms by 1930 in Pendembu was about 6,000, of which about one-half were in the Luawa Chiefdoms. From 1928 onward the small farmer has copied to an increasing extent the examples provided under the direct influence of the department.

48. The campaign with Cotton, begun in 1924, was in full swing in 1925; and a certain amount of work was done in 1926 but nothing thereafter. It was confined to Kono and Pendembu (Kisi Chiefdoms in particular) in 1925 and was extended in the north Kenema in 1926.

49. In 1925, seed was given to all chiefs in Kono District and the Kisi Chiefdoms, and at the same time vigorous propaganda was carried out by officers of the Provincial Administration and the Agricultural Department. "Experimental Cotton Farms" were made at Kainkordu, Bedu, and at the U.B.C. Mission, Jaiama (Kono). Seasonal manurial, and planting distance trials were arranged at Kainkordu and Bedu; and seasonal and manurial trials at Jaiama. The seed distributed was of an exotic upland cotton, Allen Long Staple, both new and acclimatized, and of the native Quande. At the experimental farms, trials were carried out with the above seed, and also with Nanga and Lengupa cotton.

50. In 1926, seed was only issued to natives who applied for it. A certain amount of cotton was produced and forwarded to the ginnery at Bauya provided by the British Cotton Growing Association; but the scheme was quite unsuccessful. In Kisi the Allen Long Staple did not grow well; in Kono, it was somewhat better. The acclimatized Allen Long Staple was a failure and Quande grown as a pure crop was not very successful. Fortunately in this failure there had only been propaganda among chiefs. It was due to the unsuitability of the climate, poor subordinate staff, and the circumstance that the local price for cotton was usually higher than that offered for the cotton for export.

51. The total amounts of cotton ginned at Bauya in the campaign were in 1926: Allen Long Staple, Mixed and Quande, 4,359, 1,560 and 814 lb.; and in 1927: Allen Long Staple first quality, Allen Long Staple second quality and Quande, 184, 104 and 334 lb.

52. Propaganda for Castor Beans was carried out chiefly in Kono and Pendembu Districts, by Administrative and Agricultural Officers, beginning in 1925. The natives were advised to plant the crop around their villages and the women and children were to harvest it. Seed was distributed free; and the crop was purchased by the Administrative Officers at 2*d.* per lb., and again distributed, until 1927, when distribution ceased.

53. The price of castor oil seed in England at this time was about £16 per ton; the result was that commercial firms in Sierra Leone were able to offer only 1*d.* to 1½*d.* per lb. The native farmer displayed no interest in this crop and did not want to plant it; and those who did were disappointed with the prices offered. Planting was done on a fair scale; and although propaganda was energetically carried out, the scheme came to nothing.

54. Seed and seedlings of KOLA have been supplied from time to time to chiefs who applied for them. Plantations and nurseries were made in 1930 for certain chiefs in KONO District.

55. In March, 1926, an effort was made to induce the farmers in MOYAMBA District to prepare a good quality of GINGER. A slightly higher price was offered for good-grade ginger and everywhere propaganda was carried out along with demonstrations of ginger peeling; but the results were disappointing.

56 The native farmer as a rule roughly scrapes his ginger and does not dry it properly. The campaign for improvement failed because of the poor, usually unpeelable ginger grown, because of the small difference in prices offered, and often because the crop was mortgaged before it was grown.

57. Three varieties of South African MAIZE, Potchefstroom Pearl, Hickory King and Natal Eight-row, were distributed to chiefs in KONO and PENDEMBU in 1926 and 1927. The native appears however to prefer his own type. The South African maize grew quite successfully, and heavy crops were harvested at Kainkordu Farm (*see* below) where it is still being cultivated.

58. Up to 1927, the department did nothing in connection with CACAO; it was reported in 1926 however that the people were taking it up. The following table shews progress in the Central Province since 1926 through the direct work of the department:—

1927—Pendembu	121	nurseries containing 45,000 seeds
Kenema	39	nurseries containing 12,000 seeds
1928—Pendembu	76	plantations containing 16,000 trees
Kenema	39	plantations containing 9,500 trees

	Seeds and nurseries.	Plantations.
1929—Pendembu	12,000 in 45	98
Kenema	32,000 in 108	53
Panguma	5,000 in 11	9
1930—Pendembu	13,000 in 43	2
Kenema	3,000 in 8	17

59. In 1928, nine plantations of COFFEE were made in the KONO District from canephora seedlings raised at Kainkordu.

60. The work done in 1929 was:—

District.	Kind.	Plantations.	Planted out.
Pendembu ...	Stenophylla	8	1,131
	Canephora	1	100
Kenema ...	Stenophylla	7	1,420
Kono ...	,,	1	50
Panguma ...	,,	6	410
Moyamba ...	Canephora	75	17,598
Total ...	...	98	20,709

61. In 1930 it was:—

District.	Kind.	Plantations.	Planted out.
Pendembu ...	Stenophylla	9	3,500
Kono ...	„	—	—
Kenema ...	„	26	2,600
Panguma ...	„	11	2,300
Moyamba ..	Canephora	7	1,200
Total ...	...	53	9,600

62. No attempt has ever been made to spread Pigeon Pea as a food crop although there is no doubt of its great usefulness in a native regimen. Seventy-five pounds of this pea raised at Kainkordu was sold to natives at $\frac{1}{2}d.$ per lb. in April, 1927; and encouragement for this and other legumes is well worth while.

63. Work with Vegetables has included onions and tomatoes only, at Daru (*see* below) and at Missions at Moyamba and Jaiama. The results were fair: better with tomatoes than onions.

64. Efforts on behalf of the Oil-palm comprised the following kinds: (*a*) demonstrations of proper cultivation in plots at district headquarters and in chiefdoms; (*b*) demonstrations of care and interplanting in five-acre plots of existing oil-palms. The demonstrations (*a*) were begun with a native oil-palm Henói, reputed to be one of the best kinds, at Pendembu, Panguma and Moyamba, the nurseries in the first case being made both at headquarters and in certain chiefdoms. The plots for (*b*) were chosen at Kenema (by the Forestry Department) and at Boajibu and Kailahun. This work naturally brought neither interest nor imitation; and efforts for it have ceased.

65. The next few paragraphs show the results of work that has been carried out at Demonstration and Experimental Farms in the province. These were four in number, begun and carried on in various ways.

66. In 1926, a small demonstration farm was opened at Daru, for trials of canephora coffee, kola and cacao, with an accompanying shade tree (*Cassia siamea*) and green dressing (*Calopogonium mucunoides*), as well as of South African maizes, vegetables (tomatoes and onions), various peas and beans and tobacco. After a small plot of canephora coffee had been made, and the velvet bean and cowpeas had shown that they would grow satisfactorily, the farm was handed over in 1927 to the West African Frontier Force, which with the assistance of the Agricultural Officer started a scheme for coffee and kola plots, platoon farm plots and swamp rice; but owing to the removal of the headquarters to Freetown all that remain are a swamp rice farm, which has produced very useful results, and lessons in agriculture given by a native assistant.

67. A cotton experimental farm was opened at Bedu in 1925; but failed, as shown above. Since that time, trials have been made with cacao, kola, canephora and stenophylla coffee, oil-palms, South African maizes and uba sugar-cane; but results are poor, through lack of control.

68. Similarly a cotton experimental farm was made in the same year at Kainkordu with a similar result. From 1926, the work has been conducted chiefly with canephora coffee, cacao, kola, South African maizes and groundnuts; and in spite of the neglect through inability to give proper care to crops in such an "experimental farm," fair results have been obtained with the coffee, cacao, maize and groundnuts, while kola has failed.

69. The demonstration work at Moyamba has been concerned with making a plantation of canephora coffee in 1926 to 1928 in strips in the neighbouring forest reserve, 9½ and 12 acres being planted in 1927 and 1928 from the nurseries made in the first year. The plantation was handed over to the chief in 1929; and the coffee is doing well in spite of lack of care that has caused the nurseries to fail.

70. The Distribution of Planting Material has been concerned with the crops mentioned, together with minor distribution of Nigerian and Henói oil-palms, beans, guinea corn and fruit trees.

71. The work in the Central Province, begun by Mr. J. W. D. Fisher, has been conducted with careful and unremitting effort by Mr. J. V. R. Brown, relieved for intervals by Mr. P. J. Moss.

Southern Province.

72. Agricultural work was begun by the Provincial Administration chiefly in the direction of making communal plantations of cacao and coconuts; but results have not been successful because of lack of individual interest and the difficulty of making instruction effective among those responsible only communally for a crop.

73. Planting by private individuals, without assistance from the department, has nevertheless gone on and has tended to increase during recent years, with cacao in the old Mano River and the Pujehun Districts, and particularly with Liberian coffee in the former where it is indigenous. At the present time there is considerable keenness about robusta coffee throughout the greater part of the province, and numerous applications for seed and assistance in planting have been received.

74. Regarding Cacao, the two following tables show firstly, the number of seedlings planted each year in communal plantations and secondly, the position at the present time. (In regard to the latter, a survey is now being undertaken, and some alterations to the figures may be found necessary later.)

Year.	Mano River District.	Pujehun District.	Sumbuya District.
1926 ...	5,300	8,200	3,000
1927 ...	16,000	12,800	5,200
1928 ...	15,000	3,400	9,700
1929 ...	—	—	—
1930 ...	—	—	—
Total ...	36,300	24,400	17,900

District.	Communal plantations.	Growing plants.
Mano River	115	25,653
Pujehun	60	5,828
Sumbuya	75	6,927

75. The Administration has since 1923, along with the propaganda, always impressed upon the natives the benefits of fermenting cacao for sale; and this has been demonstrated by the Agricultural Department. The method advised has been that of bulking quantities (the produce, perhaps, of several growers) in baskets. The result of all this propaganda has been a very slight improvement in the quality of the cacao exported. By far the larger part of the crop is still unfermented, merely sun-dried, or very often dried over fires in native huts.

76. In 1927, a central fermenting station was opened at Yoni in the PUJEHUN District. A fair amount of cacao is grown round this town, but it is more notable as being the chief buying centre in the area. The methods of working were modelled on similar stations in Southern Nigeria. Despite the efforts of agricultural and political officers, only 883 lb. of raw cacao was handled in this station. The owners received *5d.* a pound from the trading firms in Yoni for the fermented beans.

77. The work was continued at Yoni in 1928 and another station was opened at Zimi, with the result that only 1,353 lb. of raw cacao was handled. In 1929, fermenting was carried out by the department at several important producing centres in the districts of Mano River and Pujehun, but only 30 cwts. of raw cacao was brought in by growers to be fermented.

78. In 1923, the communal plantations of COCONUTS were made in the coastal chiefdoms of PUJEHUN, SUMBUYA and SHEBAR and SHERBRO Judicial Districts. The soil throughout this area is sandy, and except close to villages is nowhere very fertile.

79. From 1923 to 1926 the department paid for seed nuts, supplied by the people for nurseries, at the rate of 1*d.* each. Thereafter the seed nuts were supplied free by the people in the chiefdoms concerned, at an average rate of four or five nuts a year from each hut. Planting has gone on fairly steadily from 1924 to this year, always on the communal system. A few of the better palms, planted near villages in the Chiefdoms of Mesi Krim and Nongoba Bullom on Turner's Peninsula, have flowered; there is however a very wide variation in the condition of the trees all over. At first the people were prohibited from planting cassava between the young coconuts, but after 1926, this was permitted. Most of the trees have been regularly mulched with brushings from and around the plantations and in some cases they have been favoured with refuse from the outskirts of the villages.

80. The scale insect *Aspidotus destructor* Sign., has appeared in all chiefdoms and has recently been most severe on trees in Turner's Peninsula. This is without doubt due to the general weakness of plants brought about by poor soil conditions. A red fungus was artificially spread amongst the scales here with apparently beneficial results. The severity of the attack has diminished considerably of late; but this is probably due to seasonal causes combined with the better state of establishment of the palms.

81. Demonstrations in the making of copra were given in 1928 at four centres by the Agricultural Officer; and the produce was sold to the United Africa Company on behalf of the natives for prices ranging from £18 to £19 a ton.

82. The following tables show firstly, the number of seedlings planted year by year, and secondly, the present state of the plantations.

Year.	Shebar and Sherbro Judicial.	Sumbuya.	Pujehun.	Total.
1924	3,057	1,012	—	4,069
1925	10,852	2,891	4,558	18,301
1926	9,898	4,784	4,888	19,570
1927	14,791	8,283	5,715	28,789
1928	9,562	5,448	4,081	19,091
1929	12,423	7,918	3,139	23,480
1930	4,948	5,172	*—	10,120
Total	65,531	35,508	22,381	123,420

*Figures not yet verified.

District.	Chiefdom.	Plantations.	Existing Palms.	Totals of Palms.
Shebar and Sherbro Judicial ...	Nongoba Bullom	111	29,016	
	Cha ...	21	6,247	
	Bendu ...	32	4,891	
	Sitia ...	70	6,738	
	Dema ...	91	4,221	51,113
Sumbuya ...	Meai Krim ...	34	12,915	
	Baiama Krim ...	69	6,859	
	Kwako Krim ...	54	12,381	32,155
Pujehun ...	Kpaka ...	39	3,049	
	Boma Sakrim ...	13	1,288	
	Pukumu Krim	20	1,202	
	Mano Sakrim ...	93	6,472	
	Galinas ...	4	74	12,085

83. It was in 1926 that active steps were first taken to encourage the planting of COFFEE; and after some correspondence had passed between Government and the Chamber of Commerce, the Southern Province was divided for the purpose of coffee-planting into areas to each of which one kind was assigned. This division was: Liberian east of the Wanje River, and robusta in the rest of the province. Previous to this, in 1924, seed of the native stenophylla coffee had been sown in all districts by the Administration; but with no result.

84. Many thousands of seedlings of Liberian coffee were distributed from 1926 to 1928 to individual farmers from the department's nurseries at Pujehun and Zimi demonstration farms. In 1927, nurseries of robusta were made at forty villages in Gbangbama District, and only here has planting on communal lines been carried out to any extent, a small amount being done in 1928 and a good deal in 1929. This year, planting was done only for private individuals. The following tables show the present position in GBANGBAMA District (now included in Shebar and Sherbro Judicial Districts), respectively for communal and individual plantations.

Chiefdom.	Communal plantations.	Growing trees.
Imperi	17	5,084
Banta	21	2,866
Mokele	16	2,981
Totals ...	54	10,931

Chiefdom.	Individual plantations.	Growing trees.
Imperi	10	3,559
Banta	12	3,090
Mokele	13	2,797
Totals ...	35	9,446

The condition of the Gbangbama coffee plantations is good on the whole; and some of the earliest-planted trees are now bearing.

85. A summary of coffee planting in districts in the Southern Province other than Gbangbama is as follows:—

District.	Kind.	Plantations.		Trees Growing.	
		Communal.	Private.	Communal.	Private.
Mano River ...	Liberian	36	—	6,024	—
Pujehun ...	„	18	45	928	9,304
Sumbuya ...	Robusta	—	39	—	6,209
S. & S. J. Ds. ...	„	54	35	10,931	9,446
Sembehun ...	„	—	29	—	5,884
Totals ...	...	108	148	17,883	30,843

86. The first work of importance undertaken by the department in connection with the cultivation of Rice was in 1922, when a native of India was specially obtained and sent to Sherbro to demonstrate the method of planting in use in the Skarsis estuary and to make a study of the tidal swamps and flooded grass-lands of the Bum Kittam River. For some years afterwards, one of this specialist's assistants was at work in the tidal areas of the Jong and Bagru rivers endeavouring to demonstrate the Timne methods of cultivation, including planting from nurseries.

87. In 1923, felling and clearing of mangroves in the tidal swamp about Sembehun and lower down the Bagru river began, the work being carried out by forced labour; and by 1926, an area of about 250 acres had been cleared. Planting began in 1924 when eighty-four bushels of seed from the Skarsis were distributed to farmers and planted under the supervision of the department's instructors. It was perhaps too soon to expect a satisfactory yield from this land: the harvest is reported to have amounted to 280 bushels. In 1925 a slightly larger area was planted with 104 bushels of seed and yielded only 304 bushels. In 1926, seventy-one bushels of seed were sown for farms supervised by the department and about 200 bushels reaped; in 1927, 148 bushels were

distributed and no report of the yield was made as the instructor was withdrawn from the area before harvest. It is disappointing that so little success has attended the work carried out in the Bagru River: at present one sees only a few small farms along this river. The crop is invariably excellent and there is no doubt that here and in the Jong and Bum Kittam estuaries generally there are thousands of acres of potential rice lands awaiting development.

88. In 1926 and 1927 demonstration farms were made at a number of places on the Jong River and in tidal swamps in Gbangbama District. It would appear that some success has attended the former for mangrove clearing for rice-farming is increasing there slightly; but in Gbangbama little interest was taken in the work while it was in progress and no attempt to plant rice has been made by anyone in the area since. In the neighbouring Banta Chiefdom on the Gbangbatoke creek, however, rice-planting has become established.

89. Instruction was given in 1927 and 1928 on Cassada Island, which lies in the estuary of the Moa River and consists largely of tidal mangrove swamp. Much of this is capable of growing and has grown good crops of rice, but little or nothing has come of the effort made.

90. In 1927–8, the Agricultural Officer made a close study of Lake Mabese, formed by the overflow of the Masao river, a tributary of the Wanje, the waters of which recede about January to May, leaving a large area of moist rich alluvial soil available for farming. Trials of quick-maturing kinds of rice were made; but these were not very conclusive for want of sustained supervision. It is considered however that no great extension of the present small cultivations of the local "Gbali" rice is possible because the energies of the inhabitants are largely directed to fishing and to harvesting palm produce during the dry season.

91. The Agricultural Officer undertook an extensive survey of the grasslands of the Bum Kittam and Wanje rivers during 1928. It has been suggested that these might be utilized for the purpose of growing rice, particularly in conjunction with ploughing. Farming on a small scale is carried on in these areas already, the principal crops being a swamp rice, grown in places where the depth of water is not too great, a quick-maturing kind, sown when the water has receded, and garden crops such as cassava and sweet potatoes, planted at the same season of the year. This land is for the most part fairly fertile, containing a fairly large amount of organic matter; and there is ample scope for the development of planting of food crops, but the population is sparse.

92. Considerable use has been made of the inland swamps and swampy valleys for rice-growing, for years; and wet-land rice farming is on the increase. Since 1926, instruction in the transplanting method has been given in each area where the

department's instructors have been at work. Inland swamps have thus been planted in the SEMBEHUN area, behind the mangrove tidal swamps on the Jong River and the GBANGBAMA creeks, and in PUJEHUN in the area between Pujehun and Lake Mabese. Much greater difficulty has been encountered here than was experienced by the officer in charge of this area, Mr. J. W. D. Fisher, when he introduced wet-land rice planting in the inland swamps of the Central Province (Pendembu and Kono Districts) in 1925. In 1929, seven supervised farms were planted in PUJEHUN District; and this year a beginning has been possible in MANO RIVER and SUMBUYA Districts with supervised planting in seven, eight and nine farms in these three, respectively.

93. An Indo-China rice was successfully introduced into cultivation in 1929, in the more deeply flooded swamps in NONGOBA BULLOM (Shebar and Sherbro Judical Districts); and the cultivation has increased considerably this year, with great promise.

94. Demonstration plots of OIL-PALM were established in 1926 at PUJEHUN and SUMBUYA. Five acres of land carrying palms was selected in fairly rich natural stands of oil-palms and the object has been to bring these plots gradually into the semblance of small plantations by judicious thinning and planting, where necessary, records of fruit, oil and kernels being kept. Cultural work was limited to clearing undergrowth and keeping clean the stems and crowns of the palms. A third 5-acre plot was established during 1927 at GAMBIA in the rich palm belt of lower Sumbuya District, but was given up in 1929 as the necessary staff for supervision was not available. As in the other provinces, these oil-palm plots were doing no good; and have now all been abandoned.

95. A small plantation of the indigenous " seedless " Tugboi variety in the GOLA forest reserve was taken over from the Forest Department in 1928. It was extended in 1929; but its lease has been given up with that of the others this year, as an oil-palm without good kernels is of little use to Sierra Leone.

96. Some seed of thin-shelled Nigerian oil-palm was obtained from Njala and sown in nurseries for applicants in SUMBUYA and MANO RIVER Districts; and one small plantation of this was made in GBANGBAMA District in Mokele Chiefdom where the oil-palm is singularly scarce. Information regarding the distribution of the oil-palm in chiefdoms and of varieties in the natural groves has been collected in the course of tours of inspection.

97. Information regarding the incidence of a mosaic disease of the important food crop CASSAVA has been obtained: it is by far most prevalent in the sandy soils of the coastal areas. The natives have been advised to plant only cuttings from healthy

plants; but investigation of a probable immune variety or varieties, is being carried out, and distribution of these will be the most effective way of lessening the great losses that are caused by the disease.

98. The areas of principal production of Piassava have been prospected; and advice has been given in regard to improving the quality of this important product.

99. In the Sembehun-Gbangbama area more attention is given than usual to Chillies; and a visible increase in the cultivation of these has occurred in the last few years.

100. An effort was made as in the other provinces to introduce the Castor Bean in 1927, when a good deal of seed was distributed in the six districts; but its low prices caused it similarly to fail.

101. A small Demonstration Farm, or " model plantation " as it was called, was opened at Zimi in 1923 by the District Commissioner. This had the supervision of the Agricultural Department from time to time; but was closed after about six years of unsatisfactory effort.

102. A Demonstration Farm was also opened in 1926 at Pujehun, then the provincial headquarters of the department. Three acres of land was set aside for annual crops: rice, root-crops and groundnuts, grown in rotation. Five acres were planted with the following perennial crops: cacao, kola, Liberian and robusta coffee and sisal. The cacao has failed because of unsuitable site and soil; but the coffee, particularly robusta, has grown fairly satisfactorily. Here again, lack of adequate supervision was felt, particularly as the headquarters was removed from Pujehun in 1929; and the farm has been closed.

103. Farmers, mission schools and others have from time to time shared in the Distribution of Planting Material from nurseries at Pujehun, Sumbuya and Mano River Districts. Included among this have been the following: coffee (robusta and Liberian), cacao, kola, maize (South African in 1926), groundnuts, pigeon pea and Chinese yams (in large quantities during 1927 to 1930 from Pujehun demonstration farm).

104. The work in the Southern Province has been mainly (with a short acting intervals by Mr. P. J. Moss) in the hands of Mr. J. W. D. Fisher, who has usefully paid particular attention to the agricultural use of the differing areas and the best ways of improving and developing the agriculture of the farmers in them.

Agricultural Surveys.

105. A general observational survey of the Protectorate was made by the Director, for the purpose of obtaining a first-hand impression of the agricultural and economic possibilities of the country and of the progress and prospects of introduced and other crops.

106. The Agricultural Officer, Northern Province, Mr. R. R. Glanville, made a detailed and painstaking survey of the estuaries of the Great and Little Skarsis and Rokel Rivers as a basis for the work of the department to be carried out after a visit to be made by him to India and Ceylon to obtain information in the light of the survey; as well as for the assistance of firms or syndicates wishing to take part in the development of the area. The results of this survey have been published by Government (Government Printer, Freetown).

Produce Inspection.

107. The results of this, mainly through the up-country *instruction* for the preparation and proper storage of produce, have been to cause the quality of palm oil and kernels on arrival for export to be almost always satisfactory, and generally high; whilst ginger was most generally up to Grade B, none of the higher grade being offered. Raffia requires improvement; and for this samples of the best from Madagascar were imported with the assistance of the Imperial Institute, and properly tied hanks of good local quality were made and distributed for demonstration. The greatest room for improvement is in piassava, especially in the south-eastern areas (where the difficulty is increased by the extent to which the fairer conditions of sale attract the poor Liberian product); and this has been recognized by giving firms ten days' grace for sorting and cleaning until such time as increased propaganda and teaching by the department, for the production of good piassava by the producer himself, shall have become effective. The little cacao that is exported is mostly poor, and efforts for teaching proper preparation meet small success at present, through low prices; but these efforts are to be increased, on more definite and sustained lines.

108. During the year the work of instruction under produce inspection was brought into the closest connexion with the district work of Agricultural Officers; and by co-operation of these and the Inspection Officers, and firms of good standing that welcome these efforts, it is hoped to maintain and increase their effectiveness.

PROGRESS OF THE CHIEF CROPS AND PRODUCTS.

109. This is summarized largely from reports furnished by the Agricultural Officers.

110. In the Northern Province, the areas of swamp and upland rice probably increased somewhat, and yields were good almost everywhere, the latter doing best in the Bombali and Koinadugu Districts. There was sporadic but sometimes intensive damage by locusts in parts of the Karene, Kambia and Port Loko Districts in June and July, but the eaten rice was in nearly all cases replaced by cassava or sweet potatoes, so that there was no

shortage of food. Through the menace of the locust, farmers in some areas wisely increased significantly the land in root crops, as these have not so far shown attraction to this insect as food.

111. Swamp rice was greatly extended in the Central Province, and to some degree in the Southern Province, through inland planting; and yields have become greater through a better understanding of the methods of cultivation taught by the department, so that in the Districts of Bo and Pujehun assisted farmers obtained an average return of as much as 38-fold. Particularly in the southern coast-area and the Colony Peninsula the mosaic disease of cassava causes farmers much loss; and resistant kinds are being continually looked for, and distributed for their assistance.

112. The lowering of the railway freight on palm kernels in October raised the up-country price sufficiently to stimulate sales so that one-quarter of the total export took place during the last two months (as compared with one-eighth similarly in the previous year). The low prices of kola reduced the exports from those of the previous year by about one-quarter; whilst there were increases in the shipments of the other principal agricultural products, palm oil and ginger increasing by more than one-quarter, and piassava nearly doubling. The following table, giving agricultural exports in the order of last year's total values, enables pre-war and war-boom figures of exports to be compared with those of recent years; and gives evidence of the general stability of production in the country, even at the worst of times:—

Tons.

—	1913.	1923.	1929.	1930.
Palm kernels ...	49,201	59,545	60,205	56,641
Kola ...	1,865	2,545	3,127	2,271
Palm oil	2,571	3,346	2,845	3,652
Ginger	2,047	1,395	1,548	1,972
Piassava	839	1,620	1,232	2,417
Peppers	9	147	62	111
Cacao	2	29	96	80
Hides and skins ...	*9,789	10	44	4
Rice	798	9	13	175
Benniseed	36	—	179	41
Raffia	—	—	49	6
Coffee	8	4	2	5

* Leaves.

Pounds Sterling.

	1913.	1923.	1929.	1930.
Palm kernels ...	920,943	968,797	876,308	664,591
Kola	328,003	187,476	266,422	186,197
Palm oil	56,659	102,645	75,153	79,310
Ginger	35,468	46,236	59,308	57,228
Piassava	12,280	20,035	17,177	36,582
Peppers	565	11,818	5,131	4,421
Cacao	52	1,004	3,398	2,548
Hides and skins ...	4,249	723	4,656	2,296
Rice	3,991	206	220	2,151
Benniseed ...	460	—	2,997	538
Raffia	—	—	2,342	316
Coffee	598	186	112	189

LEGISLATION.

113. The following legislation dealing with agricultural matters was enacted or published for general information during the period under report:—

The Destructive Pests (Kola) Order in Council, No. 1 of 1930.

The Witch Broom (Destructive Pest) Order in Council, No. 12 of 1930.

The Native Produce Amendment Ordinance, No. 24 of 1930.

The Native Produce (Raffia) Rules, No. 29 of 1930.

METEOROLOGICAL MATTERS.

114. Stations were maintained at Njala, Newton and Masanki Experimental Stations, the records from which are given in Appendix I.

REVENUE.

115. The details of this are given in Appendix II.

A. H. KIRBY,
Director.

PART II.—AGRICULTURAL INVESTIGATION.

ENTOMOLOGICAL WORK.

1. The following account of the work is first given under the different crops with which it was done.

2. *Cassava.* Mosaic disease of this crop is extending and in the infected areas circumstances point to Aleurodidæ or mites as being responsible for its spread. Close investigations of the manner of its transmission have been in progress since October, insects and mites from infested plants being introduced into cages containing healthy plants of three varieties; but no symptoms of the disease have as yet become manifest. Seven varieties of cassava have been planted in readiness for tests as to immunity or resistance, and others will be obtained as occasion permits.

3. *Citrus.* Work has been mainly concerned with the fruit-piercing Lepidoptera, ten species of which have been observed to possess this habit in Sierra Leone: a significant matter in relation to citrus-growing in the country. The more important are *Achaea catocaloides*, Guen., *Achaea lienardi*, Boisd., *Hypocala rostrata*, F., and *Othreis fullonica*, L. The first is by far the commonest, and has apparently two main generations, emerging in June and December, and it has been found breeding on *Alchornea cordifolia*, Mull. Arg., (Euphorbiaceae). The pupal period was seven days, emergence taking place early in December. A light-trap was in action during November and December, but no fruit-piercing species were taken; neither were any to be observed at night on the fruits during these months. It may be suggested that either the December moths have not this habit or they migrate in the way attributed to *Achaea lienardi* in the Gold Coast. The fruits affected are grapefruit, orange, mandarine, tangerine and sweet lime. The punctures generally occur in the upper half of the fruit, just above the "equator."

4. *Coffee.* Robusta coffees were seriously attacked in the nursery by *Parasa vivida*, Wlk. (Limacodidae). Damage occurred in August, and the larvae made cocoons at the beginning of September; emergence of adults continued from the middle of this month onwards. The larvae aestivated for periods varying up to more than four months. The pupal period is from seventeen to twenty days. This pest is easily controlled by application of an arsenical wash.

5. *Groundnut.* As in the case of cassava, investigations were made for establishing the identity of the carrier responsible for the spread of mosaic disease. Seed was planted in October, and within a week of germination some plants were affected. In the laboratory insects from infected plants were placed on clean protected plants, but no symptoms were produced. *Aphis laburni*, Kalt., *Halticus tibialis*, Reut., and a Delphacid and Jassid common on this crop were used. It may be noted that on many infected plants no aphides were to be found.

6. *Kola.* Treatment of the nuts with a view to improving methods of storage was carried out, but no decisive results have as yet been obtained. Investigations for deciding the best methods of care of the trees for increasing yield and maintaining health are in progress.

7. *Migratory Locusts.* About twenty swarms were recorded during the period January to March, of which fourteen apparently returned to French Guinea. Some of the twenty swarms deposited eggs in about thirty places; and most of the resulting hoppers were dealt with by means of trenching, spraying and dusting with Paris green, and application of poison bait, with the effect that few were allowed to reach the adult state and travel to French Guinea in July; and no great damage was done. Only one swarm returned to French Guinea in the west, the remainder going north-east in general.

8. During November and December, about seven swarms came in from French Guinea, four from the west in the region of Kambia, and others from the north-east between 9° and 10° north latitude.

9. Flame-throwing apparatus was experimented with but its use was found to be unpractical under the conditions of Sierra Leone.

10. *Laboratory.* Plans were prepared and building begun for the extension of the facilities of the laboratory by means of an insectary.

11. *Reference Collection.* This was re-arranged, now that suitable accommodation is available. It comprises so far about 1,750 species. Over 5,000 specimens were submitted to the Imperial Institute of Entomology, and these were found to include twelve new species and twenty-seven new to the British Museum.

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Entomologist.

MYCOLOGICAL WORK.

12. The following account of the work is first given under the different crops with which it was done.

13. *Bulrush Millet.* On the crop harvested at the beginning of 1930 round Njala, smut (*Tolyposporium*) was common, but not serious.

14. Sphacelia disease, which seems to be the same as that described from the Gold Coast, was also found on this crop at Njala. This is the first record in Sierra Leone. The affected grains were replaced by black conical ergot-like stromata twice as long as the normal grain or even longer. Single-celled hyaline spores were produced on the surface of the stromata. The affected grains were recognizable soon after the millet had flowered.

15. Both Tolyposporium and Sphacelia seemed preferably to attack the later-maturing ears.

16. "Green ear" (Sclerospora) disease occurred on a plot of bulrush millet grown, as usual, in a rice field. The affected part of the plot was near an area which was badly flooded in the rains about August—September, 1929. The plants were exceptionally tall, 10 to 12 feet high; and an unusual number of lateral branches had been developed, on the majority of which the leaves were contorted and brown and shredded, and the internodes and leaves stunted, the affected leaves being packed with oospores. Rarely was a terminal inflorescence affected. In a few cases terminal and lateral inflorescences showed typical "green ear" symptoms, the ear being converted into a head of small twisted leaves.

17. *Guinea Corn.* Grain smut (*Sphacelotheca sorghi*) on native guinea corn (*Sorghum margaritiferum*) was found on a small plot at Kabala, Northern Province; and the diseased plants were burned. This is the first record of smut on the native guinea corn, the only previous record of Sphacelotheca in Sierra Leone having been on introduced Guinea corn (*Sorghum guineense* var.) grown at Makump in 1928.

18. A Cercospora causing black elliptic stromatic spots, about half inch long, was collected on the leaves of guinea corn at Njala. The spots occurred to a small extent on the stems.

19. *Maize.* Ear rot, caused by Diplodia, presumably *D. macrospora*, was common at the end of 1929 on sweet corn at Njala. The ears inside the husks were covered with a white woolly mycelium, and pycnidia were produced on the husks and over the ears inside.

20. *Rice.* Specimens of "false smut" of rice, in which certain of the grains are replaced by a large broadly elliptical lobed stroma of a dark olive colour, about 5 mm. across, have been received from Njala and Shenge both in 1929 and 1930. The fungus responsible is probably *Ustilaginoidea virens*. Both upland and swamp rices were attacked; but fortunately the disease does not appear to be very common, and is not serious when it occurs.

21. *Banana.* The Marasmius which was reported in the report for 1928 to be attacking the pseudostems of bananas has been identified by the Imperial Mycological Institute as *M. stenophyllus*

Mont. (*M. semiustus* Mass.). It has been reported on Guinea Negro banana and, to a lesser extent, on bananas of the Canary type growing on low-lying heavy soil near the river at Makump, Northern Province. The same fungus has also been found attacking plantains two months after they were planted in vicinity of the diseased bananas. Fructifications were noted on the pseudostems of the bananas in August and were still present at the end of 1930.

22. *Cabbage.* A zoned, circular dark grey leaf spot of cabbage and kohl rabi, caused by Alternaria, was common in a garden at Njala. In some cases the attack was such that the plants were reduced to black rotting masses. Faulty watering was the main cause of the severe disease, the water having been applied over the leaves of the plants during the dry season.

23. *Cacao.* Another case of pink disease (*Corticium salmonicolor*) on cacao was reported from near Makump, Northern Province, this year.

24. *Cassava.* A die-back of cassava at Makump was associated with Gloeosporium, which was considered to be the cause of the disease. The damage was reported to be confined to the topmost twigs and to be present on only a few adjacent plants. The affected twigs were removed and burned, and no further spread of the trouble has been reported.

25. *Citrus.* Scab was common in 1930 on the leaves of the young grapefruit at Njala as in previous years, and was also present on leaves of these at Newton. Fruits of young Genoa lemon trees near the grapefruits at Njala were scabbed, though the leaves of the Genoa lemons were free from the disease. Scab was also present in 1930 more or less commonly on leaves and fruit of old rough lemon trees at Njala, though not as abundantly as on the common lemon. In 1929, these rough lemon trees were more or less free from scab.

26. Gloeosporium was very common in the latter part of 1930 on young lemons at Njala, causing extensive blotches on most of the leaves of the plants. Periodic spraying with Bordeaux mixture gave no control, but by February, 1931 (the middle of the dry season), infection had become infrequent. Elsewhere at Njala this disease, though constantly present, has been rare.

27. *Coffee.* Specimens of white thread on Liberian coffee were received from Zimi, Southern Province. The fungus was also present on an old kola tree in the bush adjacent to the coffee and on two wild trees (Myrianthus and Newbouldia) close by.

28. *Kola.* Specimens of *Fomes lamaoensis* Murr. were received from dead kola trees at Sian, near Port Loko; and it seems probable that this was the cause of death of the trees.

29. *Miscellaneous Plants.* Horse-hair blight has been observed on several different species of wild trees and bushes round Njala.

30. *Rhizoctonia solani* has been seen again on bush greens (Amaranthus), carrots and turnips in gardens, being especially common where adequate thinning of the plants in the beds had not been carried out. Rhizoctonia was also recorded on chillies and on *Thevetia neriifolia*, attacking the leaves and young stems in both cases and causing dieback.

31. *Sclerotium rolfsii* was again common in gardens at Njala. As before, it has been common on red "lilies" (Hippeastrum) and on pereminal Coreopsis, which seems to be very susceptible to Sclerotium and was in several cases killed out by the fungus.

32. Several fungi, chiefly rusts and smuts, have been collected on wild host plants. The only identification so far received is *Uredo rottboelliae* Dietl., collected on leaves of *Rottboellia exaltata* L. at Njala. Uredospores only were found.

33. *Herbarium*. This has been kept by the Mycologist, and now contains about 2,000 specimens, of which over 250, chiefly of grasses and sedges, were added in the year under report. Most of the specimens were collected by Mr. R. R. Glanville, Agricultural Officer, Northern Province, particularly in connexion with his survey of the Skarsis rice area. Duplicates of the specimens have been sent to the Royal Botanic Gardens, Kew.

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Mycologist.

CHEMICAL WORK.

34. On its removal from Freetown to Njala the chemical laboratory was not ready for occupation until the end of January and the gas supply was not installed until March. February was spent in unpacking stores and arranging the laboratory, and on completion of the gas-plant work was started on making up standard solutions, etc.; but this was held up during almost the whole of April owing to a breakdown of the plant. The Chemist was absent from Njala on local leave from 18th September, to 20th October. December was spent in writing reports, and checking the stores and library, etc., in preparation for the closing of the chemical branch. The actual period of work was not more than six months.

35. Samples received were as follows:—

Soils—Northern Province	...	119	dealt with	119
Central Province	...	53	„ „	21
Southern Province	...	2	„ „	2
Belgian Congo ...	...	12	„ „	12
England ...	...	5	„ „	5
Clays for brickmaking ...	...	2	„ „	2
Termite heaps ...	...	4	„ „	2
Manures	...	1	„ „	1
Palm oil and oil-palm products	...	17	„ „	17
Guinea corn and maize products	...	4	„ „	4
Calopogonium seeds ...	...	1	„ „	1
Pia-sava	...	1	„ „	1
Cacao products ...	...	2	„ „	2
Rocks	...	3	„ „	—

36. *Absorption of Phosphates by the Clay Fractions of Lateritic and Non-lateritic Soils.* This work was undertaken in order to find out the differences which occurred when various soils were treated with phosphate manures, soils from England (5), Sierra Leone (6), Gold Coast (2) and Nigeria (2) being used; and a full report was submitted separately. Briefly, the results showed that absorption of phosphates by lateritic soils depends almost entirely on the iron content and that such phosphates are probably held in a condition unavailable to the plant: the more non-lateritic a soil, the greater the possibility of absorbed phosphates being available to the crops. It is regretted that this work could not be extended to cover the absorption effects of these soils on ammonium and potash salts, which was originally intended.

37. *Swamp Rice Soils in the Skarsis and Rokel Estuaries.* A full report has been submitted on this work. The number of soils dealt with was 119, and the results show that little or nothing is known about the conditions which affect the fertility of swamp rice as regards salt-content (from sea-water) and acidity (from mangrove roots). It was interesting to observe that the acidity of the top few inches of soils under rice cultivation for twenty to thirty years had dropped very considerably, and it is possibly that in another twenty to thirty years this decreasing acidity might affect the yield of rice.

38. *Other Work with Soils.* No special features of interest were found in the remaining soils which were examined except that the addition of ashes and incinerator refuse to nursery soils at Njala depressed the growth of young plants. The soils so treated was found to be appreciably less acid than in the control plot, and the supposition was that this increased alkalinity affected the tilth by partial deflocculation of the clay.

39. *Clays for Brickmaking.* Two clays from Kenema were examined and reported on. As far as laboratory methods can be of use in this respect there was no reason to suppose that satisfactory bricks could not be made from these materials.

40. *Termite Heaps.* Samples were taken from an old termite heap under vegetation and a " living " termite heap devoid of vegetation. The samples were analysed and portions sent to Rothamsted for bacteriological investigation. The results showed that the bacterial content of the old heap was about four times as great as that of the living heap. It is understood that the Rothamsted Authorities are continuing the investigation.

41. *Manure.* A mixed manure consisting of muriate of potash, superphosphate, sulphate of ammonia and lime was analysed for the Agricultural Officer at Njala; with the expected result that re-actions were found to have taken place within the manure during storage.

42. *Palm Oil and Oil-Palm Products.* A thorough trial was carried out with the " Voms " palm oil extraction plant, using Nigerian thin—and thick-shelled palms and the local variety called Kawei, comparisons being made between extractions with the machine and by native methods. A report was issued showing that the machine extracted more oil, and oil of a better quality than was obtained by native methods, but that the increase was obtained by a greater use of labour. The time taken in extraction was the same for both processes.

43. *Guinea Corn, Maize and Cacao Products.* Samples were received from Messrs. D. B. Curry & Co., Freetown, for which analysis of the oil-content, moisture and water-soluble products were made; and reports and advice were supplied.

44. *Seeds of Calopogonium mucunoides.* As this was being grown as a cover crop on Njala Farm, determinations were made with the help of Mr. P. J. Moss, Agricultural Officer, of the oil-content of the seeds in order to find out if any use could be found for them. The oil-content was negligible.

45. *Piassava.* Examination of a sample of piassava damaged on shipment and submitted by the Inspector of Plants and Produce showed that the damage had been probably caused by storing the material, possibly in a wet state, too close to boilers.

46. *Publication.* The subject-matter of the paper entitled " The Soil Survey of Sierra Leone " was revised and brought up to date. Tracings of maps of Sierra Leone were made and from these sun-prints were taken. Two soil maps and two geological maps of Sierra Leone were made on the sun-prints.

47. *Lysimeters.* Advice was obtained early in the year from Rothamsted on the subjects of Lysimeters (soil drain-gauges). Three trial holes were dug to a depth of 6 feet and mechanical analyses made on each foot of soil in order to find a suitable area without soil variation for the construction of lysimeters; but owing to closing of the chemical branch this work is now in abeyance.

48. *Effect of Clearing Bush on the Organic Matter Content of the Soil.* As a preliminary to further intended work, a piece

of bush was cleared of all vegetation, stumps not being removed in order to avoid soil disturbance. Twelve samples were taken to a depth of six inches from this cleared land and twelve from a similar area on the adjoining uncleared bush. Each of the twelve samples was thoroughly mixed and four organic matter determinations were made on the soil from each mixture, the average of the results being as follows: soil from bush-land 7·95, soil from cleared 8·45, per cent.

49. *New Method of Determination of Active Organic Matter in Soils.* The method depends on the reduction of iron by organic matter which had been brought into solution by dilute acid; it has been tried only on four soils at present and details are given in a separate report.

H. C. DOYNE,
Agricultural Chemist.

NJALA AGRICULTURAL STATION.

50. The work was managed by the following Agricultural Officers, as shown: Mr. J. V. R. Brown and Mr. J. D. Fisher for about two months each in the first part of the year, and for the rest of the time by Mr. E. I. Nisbett, who has made the records (except those for oil-palms) used in the following report.

51. *Perennial Crops.* This heading does not here cover oil-palms, which receive separate report below.

52. The plots of Citrus received care, and some of the grape fruit was used for supplying Newton Experimental Fruit Farm with budwood. Recording for the Sierra Leone limes on the North Farm has ceased, as the difference of conditions, including flooding, makes the results useless, especially for comparison. The yields in bushels per 100 trees from the Dominica limes, since the variant of thinning was introduced, have been as follows, *A* being thinned by removing alternate trees, *B* being at the original distance of 15 feet by 15 feet, unthinned:—

	Section 1.		Section 2.		Section 3.	
	A	B	A	B	A	B
1928	633	763	370	474	455	431
1929	681	512	465	372	389	247
1930	532	392	492	259	257	186

Altogether, citrus is the most promising of the perennial crops at the station.

53. The Coffee, consisting of robusta, canephora, Liberian and stenophylla, was cutlassed, but given no further treatment. The pathological condition of the plants, due to lack of shade, failure to prune properly and often unsuitable situation, causes manurial experiments with them to be unjustified (even if they

possessed any practical value), and these have been abandoned. The plants of Liberian and stenophylla are to be cut out (except for a few on the North Farm and near the arboretum, respectively); whilst the robusta kinds are to be kept with all reasonable care for a time, to give assistance for the seed supply that is so urgently required.

54. The yields of the KOLA are so small as to be valueless for indicating the results of any variant treatment; and it is hoped to find means of dealing with this condition.

55. The SISAL is maintained as an economical provision of cordage (which is available to other Departments).

56. No work was done with the plot of Para RUBBER, except for cutlassing undergrowth; and it is to be considered whether this area can be usefully freed for providing room for work with other crops.

57. In view of the investigations that are being carried out at Newton Experimental Fruit Farm, the plots of BANANAS (incorrectly called Canary bananas) have been abandoned.

58. Because of its entire unsuitability, the TEA is being cut out.

59. *Annual Crops.* Twenty-one varieties of SWAMP RICE collected from different parts of the country were sown in May—June and transplanted to 1/80-acre plots during the third week of July, the purpose being to compare their characters. The results were as follows, the yields to be taken as fair to good, except where otherwise stated:—

Name.	Date of harvest.	Characters, etc.
Pa Yaka ...	December 5	Good tillering uniform maturity.
Indo China ...	January 6	Only moderate.
Pa Yenti ...	November 11	Yield only fair; moderate uniformity.
Pa Mampa ...	January 6	Good tillering; sturdy and short.
Pa Fodea ...	January 6	Poor kind; maturity irregular.
Pa Litoma S.P.	December 22	Fair to good tillering; sturdy; uniform maturity.
Pa Bis ...	January 21	Moderate tillering; poor yield.
Pa Kanlu ...	January 6	Fair tillering; (mixed sample).
Black Yakei ...	January 6	Fair tillering; maturity irregular.
Pa Lal ...	January 21	Fair to good tillering; maturity irregular.
Jabati ...	January 7	Fair tillering; even size and maturity.
Pa Bolo ...	January 6	Good tillering; irregular; (mixed sample).

Name.	Date of harvest.	Characters, etc.
Pa Yoso ...	November 11	A well-yielding, uniform rice.
Pa Kanukafol	January 6	Moderate and irregular.
Pa Indian ...	January 6	Poor tillering; size and maturity uniform.
Pa D. C. ...	November 17	Unsuccessful in poorly-watered plot.
Pa Totoko ...	November 17	Good yield of pure white grain.
Gbongo Yakei	January 6	Good tillering; short strawed; maturity very irregular.
Pa Kunko ...	November 17	Poor and irregular.
Hinati H.D. 15	November 7	Fair throughout.
Gbari ...	September 22	Not successful.

60. Similarly, trials were made with sixteen varieties of Upland Rice, with the following results:—

Name.	When sown, June.	Date of harvest.	Yield in —fold.	Average of tillers.
Yofeni ...	2	Oct. 17 ...	26	7·1
Bondobai ...	2	Oct. 4 ...	33	7·9
Pindi ...	2	Sept. 10 ...	9·5	6·3
Ndulawai 1 ...	2	Oct. 1 ...	16	8·8
„ 2 ...	2	Oct. 1 ...	10·3	9·2
„ 3 ...	2	Oct. 1 ...	8·7	5·9
Wojawui ...	2	Sept. 20 ...	6	7·4
Manjali ...	11	Oct. 28 ...	74	8·1
Boguti 1 ...	2	Oct. 28 ...	17	4·7
„ 2 ...	2	Oct. 28 ...	7·5	6·5
Jojai ...	2	Oct. 3 ...	15	13·3
Joboi 1 ...	2	Nov. 4 ...	3	5·2
„ 2 ...	11	Nov. 4 ...	5	4·6
Pa Kunko ...	11	Oct. 17 ...	11	6·9
Pilajoli ...	2	Nov. 4 ...	5	6·2
Tupubei 1 ...	2	Oct. 1 ...	8	7·6
„ 2 ...	2	Oct. 1 ...	9	8·1
„ 3 ...	2	Oct. 1 ...	14	7·5
Panepani ...	2	Oct. 8 ...	6	5·5
Ngeama gobai	2	Oct. 28 ...	8	7·4

61. Four indigenous kinds of Cassava, to which the names Black, White, Shenge and Mayugbe had been attributed, were planted for determining their characters and promise; and this important work will be continued and extended.

62. Cultivation trials were made with GROUNDNUTS, quarter acres being sown on ridges, on the flat and on beds; and yields of shelled nuts at the rate of 318, 416 and 830 lb. per acre were respectively obtained.

63. Trials of three varities of GUINEA CORN from French Guinea, called Tayola, Tayim and Lomba, failed through poor seed.

64. Plots of PIGEON PEA, SWORD BEANS, and Chinese and Nigerian YAMS, which all grew satisfactorily, were maintained for supplying stock for distribution.

65. Observation plots of COVER CROPS showed that, as was to be expected, whilst cowpea was effective as a smother during its shorter life, Bengal bean and *Calopogonium mucunoides* functioned well with the dry season, the former being however, far the better both as providing smother and continuation of occupation through volunteers. The perennial cover crops, pigeon pea, *Tephrosia candida and Crotalaria striata* also grew well.

66. Although trials with the SOYBEAN in 1929 had failed, they were repeated, for the purpose of obtaining first-hand information, this time with some of the plots inoculated with its special strains of nodule-forming bacteria, with the same result. This subtropical crop is of no use to Sierra Leone (which in any case possesses its own oil-producing industry).

67. *Oil-Palms.* Cultural operations were confined as before to cutlassing the grass; and removing old leaves from the palms and ring-weeding them.

68. The KINDS and numbers of trees of different types in the block as so far determined (end of 1930) is:—

Thick-shelled	...	(B) 157	
Thin-shelled	...	(A) 143	(exclusive ef "tugboi" type)
Medium-shelled	...	(C) 15	(arbitrary group
Mantled	...	(D) 1	
Tugboi		5	
Undetermined	...	13	
Total	...	334	

69. One B palm (III/7) died in May, 1930, after yielding quite well, and was removed. As its position was very low-lying, no replacement will be made.

70. Tree XX/14, which has continued to bear thick-shelled fruit only, although it was reported in 1926 to have borne mantled fruit, has been included in the B group in 1930. The mantled group (D) consists therefore now of only one tree, XXI/4.

71. Two new trees, both of the A type (thin-shelled fruit), came into bearing for the first time in March. These are Nos. IX/10 and XXIV/2.

72. Five trees of B and five trees of A did not bear any fruit. They were: B, I/9, IX/2, XXI/7, XXI/15, and XXII/14; and A, II/12, VII/7, IX/13, XXI/2, XXIII/14.

73. For comparison, the trees which did not bear fruit in 1929 are given: B, *I/9*, XIII/13, XIV/12, XXII/13; A, *II/12*, *IX/13*, X/8, XV/4, *XXI/2*. The numbers of those which did not bear either in 1929 or 1930 are in italics; these have never given good yields. No. XXI/2 did not bear in 1928.

74. Of the others listed above which have ceased yielding for one year, No. XXI/7 only began to bear fruit in 1929. Poor yields were given by most of these in other years; but XXI/15 gave average yields in 1928 and 1929, and XXIII/13 bore three large heads of fruit in 1930.

75. The figures for the YIELD of the different types, the yield of the whole plantation, and of averages, etc., are given in appendices IIIA to IIIG.

76. The yields for February, March, April, May and June were higher than for the corresponding months in 1929; but the yields for the other months were less than in 1929. The total yield of fruit was 1,035 lb. less than in 1929, and the total weight of heads harvested was 1,970 lb. less. The number of heads harvested which contained fruit was 322 less than in 1929, but there was an increase of thirty-two in the number of "blind" heads harvested. The number of new heads formed during the year was 804 less than in 1929.

77. The yield of the thick and thin-shelled compared with that in 1929 was:—

B type—number of heads harvested,		179 less
weight of heads	„	1,220 lb. less
weight of fruit	„	525 lb. less
A type—number of heads	„	108 less
weight of heads	„	522 lb. less
weight of fruit	„	214 lb. less

78. During 1929 and 1930 there has been a gradual reduction of yield from the trees. It is possible that this is merely a temporary "resting" phase for a large number of the trees; but it may be that manuring is necessary. It is not, however, recommended that manuring should be carried out, as conclusions as to the reason for the decrease in yield can only be made if the block is unmanured. Furthermore, the block is too uneven and small to be divided into manured and unmanured sections.

79. There seems to be a tendency for trees to give fewer and larger heads and the fruiting season is shortened to the February—May period. The second main fruiting season which was shown by some trees in past years seems to be missed out and all trees tend to have one fruiting season in the early part of the year now. Again, the proportion of fruit per head for the thin-shelled type was below 50 per cent. during several months, while the proportion in the thick-shelled type was about 60 per cent.

80. In regard to Flowering, the number of female inflorescences at anthesis increased in the later months as before; but the minor increase which occurred in 1927, 1928 and 1929 about the months of February—April was missing in 1930. (This seems to confirm the conclusions in "Growth Correlation in the Oil-Palm," Ann. App. Biol. XII, 1925). This affects, of course, the period of fruiting, and will be correlated in 1931 with a main fruiting season about February—May and no minor increase later in the year such as was shown in records for the past five years.

81. Figures for average weight of stalk, as calculated by difference, are not given for this year, as they seem to be of no value.

82. The variation in the number of male inflorescences at anthesis in different months, shown in the last appendix, is similar to those of 1928 and 1929. There is a minimum in June. There has been an increase on that for 1929; and over 1,000 male inflorescences came into flower this year. The number at anthesis during 1930 was more than twice the number of female inflorescences. There appears to be on the plot a gradual reduction in number of female inflorescences produced and a corresponding increase in the number of male. The proportion of male to female inflorescences at anthesis in different months now approaches the figures given in the paper referred to above, dealing with palms which appear to be older than those being reported upon here.

83. The Average Weight of Fruit per head for thick-shelled was nearly $3\frac{1}{2}$ lb. more than that for thin-shelled, the actual figures being 9 lb. and 5 lb. 11 oz., respectively. The average yield of B palms was one-and-a-half times that of the A.

84. As in previous years there was a larger proportion of high-yielding trees in the thick-shelled than in the thin-shelled group (highest-yielding B palm gave $138\frac{1}{2}$ lb. of fruit as against only $91\frac{1}{4}$ lb. for the highest-yielding A).

85. As regards the total yield of fruit for individual trees for the five years 1926–1930, the B, which had the highest yield for 1926–1929, have still the highest yields when the data for 1930 are added. With the A trees, however, this is rarely the case. Only one of the A has given constant high yields.

86. As regards Breeding and Selection the conclusions arrived at on pages 20–21 of the report for 1926–1928 (Agricultural Department Bulletin No. 7) still hold. While it would be difficult to say which are the best-yielding A palms to breed from, the best yielders of B are a number of definite trees which have *constantly* given good yields. As to which type gives most promise for breeding, the final decision will have to depend on whether it is considered better to have a uniform type of fruit as regards size, thickness of shell, etc., or to have a larger possible yield of oil from fruit which varies in size, thickness of shell and pericarp and size of "pit" (kernel and shell). This will naturally depend on the kind of manufacturing machinery now available or which can be produced in the future.

87. The Native Oil-Palm Plots have been subjected to the same simple cultural operations as the Nigerian plot.

The following yields were recorded for 1930:—

Kind.	Age, years.	Number.	Number bearing.	Heads, number.	Heads, lb.	Fruit, lb.
Henói ...	6	104	89	564	901	425
Kawei ..	6	162	140	1,176	3,052	1,774
Kpolei ...	5	74	45	218	399	213
Angola ...	4	6	6	48	102	52

88. One hundred and four trees of the Deli type, received from Sumatra, which were sown in the nursery in November, 1927, were planted out in June, 1930.

89. This report on the work has been made by Mr. F. C. Deighton, Mycologist, who had charge of it except during a prolonged absence on leave, when it was under the supervision of Mr. E. I. Nisbett.

EXPERIMENTAL FRUIT FARM, NEWTON.

90. The Manager, Mr. M. Vardy, and the Assistant Manager, Mr. J. Eaden, were in sole charge of the farm from 20th April to 10th August and 24th August to 31st December, respectively.

91. *Buildings.* The building programme for the year was three African quarters and a packing shed for bananas. Work on the African quarters was begun on 10th January and the three buildings were completed the first week in April. These are situated on the southern boundary of the Farm within 200 yards of the south-west corner, and consist of detached two-roomed houses with back and front verandahs, and built of mud blocks, the walls being faced with cement. The floors are concrete and

the roofs galvanized iron, each room having a ceiling of celotex. Each house has a detached kitchen and also an outside earth closet. The quarters are supplied with water from the Farm supply.

92. The Banana Shed is situated at the west end of the Fertiliser Trial Section, and is built of mud blocks and faced with cement, the roof being of galvanized iron and the floor concrete. In order to make the building as proof as possible against termites the door and window frames are made of cement and the doors and shutters hang on hooks set in the frames.

93. *Water-supply.* This was completed by the Public Works Department in April, according to the original plan; and the Public Health Engineer visited the Farm on 24th April, and inspected the work, the well, and the pumping plant. In the dry season the supply is barely adequate for irrigating the Nursery and Banana Plot, and for the requirements of the houses, European and African.

94. *Citrus Nursery.* Some of the seedling stock of first sowing, of sour orange and rough lemon were ready for budding in April. Of the second sowing, the strongest seedlings of sour and sweet orange and rough lemon, sown in November to December, 1929 and February, 1930, were planted out in nursery beds during the months of May, June and August.

95. The first budding was done on 13th and 14th April, and continued throughout the year. Though it was not anticipated that satisfactory results could be expected during the very wet and very dry seasons, budding was continued through these months to ascertain whether this is the case. As a result of this it was found that so far the best months for budding are apparently April to May, and October to November, when about 50 per cent. of the buds take. The results on the whole have been disappointing, but it should be borne in mind that subordinate staff has to be trained; whilst the ravages of such pests as crickets and termites have caused considerable losses despite the control methods employed against them. The number of crickets caught in the nursery now totals over 27,000, and termites are still giving trouble.

96. *Banana Trials.* Except for the planting of four guard-rows of bananas on the west end of section T. IV, the area under bananas has not been increased. The previous year's mulch in all sections has been ploughed in and fertilisers and mulch applied according to the Scheme of Work. The plants in the Fertiliser Trials Section T, Divisions I and II which have received complete fertilisers are producing the better bunches.

The local demand for the fruit has been poor, despite the reduction in price and the fact that purchasers have expressed satisfaction with the fruit supplied.

97. *Grapefruit Area.* The whole of this area, 43 acres, has been stumped, lined out and mulch applied to each tree-station. Between the rows lined out for the trees the land has been ploughed and ridged against the slope to prevent soil-wash, and *Tephrosia candida* planted on the ridges as a cover crop.

98. *Grapefruit Trees from Florida.* Of the thirty-five plants of McCarty grapefruit received in July, 1929, nine have died, while the remainder have made such good progress that budwood is now available from them; although as these trees have not yet come into bearing their value is not certain.

99. Twenty-four (two year) trees of Duncan grapefruit ordered from the Glen St. Mary Nurseries Company on 13th May were received on 3rd July. Twenty trees were planted on 4th July in Section C.II, south of No. 2 quarters, and four in the compound of No. 1 quarters. One tree in Section C.II has died but the remainder appear to be established.

100. *Avocado Pear.* Vacancies in the plot were filled with seedling trees from Njala in July. Pigeon peas were planted at the same time for shade purposes but for some reason or other they did very badly and did not furnish the protective shade expected. *Calopogonium mucunoides* sown in May for manurial purposes was ploughed-in, in August, after which *Tephrosia candida* was sown as a cover crop.

101. *Pineapples.* Acting on a suggestion by the Director of Agriculture, five plots of pineapples have been planted: three on 21st August with a native variety from Waterloo (Sierra Leone), the fourth on 9th September with the variety "Queen," received from the Gold Coast, and the fifth with an unnamed kind from French Guinea on 3rd January, 1931.

102. *Cattle and Implements.* When Mr. F. A. Stockdale, the Agricultural Adviser to the Colonial Office, visited Newton in November, 1929, he recommended that cattle and ploughs should be given a trial before purchasing a power-driven machine for cultivation purposes. The recommendation was acted on, and a pair of trained oxen were sent to Newton from Njala on 17th April together with a Ransome VY 3 plough and gear. A younger pair of animals were bought in Freetown in May and have been trained at Newton. It is open to doubt whether this method of cultivation can be continued profitably in the banana area.

103. *Visitors.* The number of visitors during the year was forty-two.

M. VARDY,
Manager.

MASANKI OIL-PALM PLANTATION.

104. During the first part of the year the work in Block I (Henói) consisted mainly of maintenance and the completion of planting, with the necessary stumping for the latter, the work and expenditure being greater than normal because the first preparation was only clear felling. The work for Block II (Nigerian thin-shelled) was similar for $1\frac{1}{2}$ of the 13 plots, which had already been planted; but preparation, and planting as far as possible, were done in respect of $7\frac{1}{2}$ of the plots (the remaining total of four plots being left for next year). In Block III (Nigerian thin-shelled and Deli), the work was preparation and some planting in two of the thirteen plots (one planted already in Deli). The largest amount of work for planting was done in Block IV (Nigerian of both kinds and Deli), where clearing, stumping and planting as far as possible were done in twelve out of the sixteen plots.

105. In the latter half of the year (which contains the greater part of the suitable rainy season) the planting just indicated was completed, and the very necessary recurrent work for the protection of the plantation from fire was put in hand.

106. At the end of the year the total planting that had been completed to date comprised (in round numbers): Henói 36,500, Nigerian thin-shelled 25,900, Nigerian thick-shelled 23,700, Deli 2,190; and more than ample nursery stock was available for completing the planting of these (with supplying of vacancies), the quantities estimated to be required being respectively 2,000, 41,500, 500 and 230 seedlings, leaving useful surpluses (except for Deli) for unforseen emergencies or further planting.

107. This means that there is left for clearing (brushing, and stumping where required) and planting in 1931 (plots being of about 40 acres each): Block II, four plots; Block III, ten plots; Block IV, four plots.

108. The work has been carried out by the Assistant Manager, Mr. I. G. C. Squire, and the European Overseer, Mr. W. F. Williams; and it is due largely to their activity that it has been done economically with greater speed and thoroughness.

Appendix I.

METEOROLOGICAL RECORDS.

Njala Agricultural Station—Averages of Meteorological Observations.

	Thermometers.			Hygrometers.				Rain Gauge.					Weather Observations.				
	Shade.		Extreme daily variation.	Dry bulb. 9 a.m. and 5 p.m.	Wet bulb. 9 a.m. and 5 p.m.	Dew point.	Relative humidity.	Total rainfall during month.	Daily average.	Greatest amount.		Number of days on which rain fell.	Amount of cloud.	Thunder storms.	Clear sky.	Over cast.	Gales.
	Maximum 5 p.m.	Minimum 9 a.m.								On one day was	And that day was						
January	90·29	68·45	21·84	76·13 85·00	73·45 76·77	71·44	75·39	Nil	...	...	...	Nil	8·31	Nil	3	24	Nil
February	94·28	69·32	24·96	77·89 89·43	74·61 77·61	71·27	68·63	·45	·02	·34	20th	3	6·91	4	Nil	9	,,
March	94·87	69·97	24·90	79·61 88·26	73·64 76·03	68·94	61·87	·62	·02	·29	27th	4	8·06	5	,,	18	,,
April	94·93	71·17	23·76	80·50 87·67	74·37 76·53	69·86	63·72	3·34	·11	1·3	10th	9	7·65	3	,,	11	,,
May	90·84	72·35	18·48	79·48 82·29	75·87 77·16	73·62	79·44	15·22	·49	4·45	30th	22	8·92	4	,,	18	,,
June	88·67	70·90	17·77	78·0 81·13	74·43 75·87	72·16	78·88	16·60	·55	2·48	10th	21	7·80	6	,,	7	,,
July	84·74	70·97	13·77	76·84 77·13	74·55 74·81	73·09	87·94	14·67	·47	2·40	7th	25	8·91	Nil	,,	15	,,
August	83·26	70·71	12·26	76·23 76·13	74·19 74·52	73·26	90·69	30·31	·98	8·60	4th	29	9·34	,,	,,	24	,,
September ...	85·57	71·90	14·00	77·70 77·33	75·70 75·60	74·37	90·30	22·92	·76	3·53	14th	29	9·08	,,	,,	20	,,
October	88·90	71·06	17·84	79·74 80·45	76·32 77·16	74·47	83·27	9·40	·30	2·09	16th	27	7·35	12	,,	13	2
November ...	91·87	71·73	20·47	79·97 83·60	76·87 79·30	75·46	82·23	10·39	·35	4·29	14th	16	8·33	Nil	,,	7	1
December ...	91·48	71·10	20·39	78·48 84·61	76·00 79·16	74·95	80·87	4·15	·13	1·10	6th	6	7·10	5	,,	6	1

Appendix I.—*continued.*

EXPERIMENTAL FRUIT FARM, NEWTON.

RAINFALL.

	Number of days on which rain fell.	Inches.
January	—	0·00
February	1	0·17
March	2	1·72
April	2	1·21
May	12	9·83
June	11	13·10
July	14	22·70
August	16	22·24
September	18	23·48
October	17	9·91
November	6	3·42
December	1	·93
Totals	100	108·71

MASANKI PALM PLANTATION.

RAINFALL.

	Number of days on which rain fell.	Inches.
October	25	9·77
November	12	2·27
December	3	1·30

(Recording began in October.)

Appendix II.

REVENUE.

	£	s.	d.	£	s.	d.
LICENCES :						
Produce	1,189	7	6			
Fines for contravention of Produce Ordinance	92	1	6			
Verification of weights and measures	50	7	0			
Departmental Fines	4	15	9	1,336	11	9
FEES OF COURT OR OFFICE, ETC. :						
Sale of Government stores ...	1	5	6			
Sale of produce	96	14	3			
Sales, Fruit Farm, Newton ...	52	14	4			
Sales, oil-palm plantation, Masauki	65	18	1	216	12	2
Total				£1,553	3	11

Appendix IIIA.

OIL PALMS, NJALA, 1930.

	Yield of A.				Yield of B.				Yield of C.				Yield of D.			
	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads lb. and oz.	Weight of fruit lb. and oz.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads lb. and oz.	Weight of fruit lb. and oz.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads lb. and oz.	Weight of fruit lb. and oz.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads lb. and oz.	Weight of fruit lb. and oz.
January	30	37	532·12	257·14	32	44	641·10	415·10	3	3	47·10	28· 0	1	1	21· 4	12·13
February ...	48	82	835· 8	392·14	55	106	1,574· 4	1,029·10	7	11	134· 8	77·12	1	2	31· 6	17·16
March	82	199	2,088· 2	1,098· 6	87	182	2,542· 8	1,674·12	7	19	230·12	131·14	1	3	45·66	25· 8
April	72	155	1,765·14	950·14	74	156	2,208· 0	1,484·14	8	15	215·12	129·10	—	—	—	—
May	53	123	1,575·12	804·14	45	110	1,715· 8	1,098· 6	5	14	173· 4	101·12	—	—	—	—
June	21	35	367· 8	159·12	29	46	412· 2	206·10	2	3	29· 6	16· 4	—	—	—	—
July	14	18	174·14	68·14	18	26	254·14	131· 2	3	4	24·10	9·10	—	—	—	—
August	17	19	187·12	91· 2	25	32	440· 0	234· 8	1	1	7· 4	2· 4	—	—	—	—
September ...	19	21	185· 4	74· 2	15	20	253·14	142· 0	1	1	25·12	13· 2	—	—	—	—
October	30	44	504·12	235·12	18	25	405· 8	243· 8	2	2	22·12	7· 8	—	—	—	—
November ...	17	20	259·14	122·10	10	10	196· 2	126· 4	—	—	—	—	—	—	—	—
December ...	5	5	77· 2	40·10	4	9	139· 0	82·12	—	—	—	—	—	—	—	—
Total ...	143	758	8,555· 2	4,297·12	153	766	10,783·6	6,870· 0	15	73	911·10	511·12	1	6	98· 0	55· 1

Appendix IIIB.

OIL PALMS, NJALA, 1930.

YIELD OF WHOLE PLANTATION.

	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested. lb.	oz.	Weight of fruit. lb.	oz.	Number of heads on trees at end of month.	Number of new heads (female inflorescences at anthesis) formed per month.
January ...	66	77+ 61 blind = 138	1,109	4	619	9	1,375	63
February ...	111	201+ 9 „ = 210	2,575	10	1,517	10	1,223	58
March ...	177	403+ 32 „ = 435	4,906	12	2,930	8	831	43
April ...	154	326+ 28 „ = 354	4,189	10	2,565	6	553	76
May	103	247+ 31 „ = 278	3,464	8	1,905	0	344	69
June	52	84+ 18 „ = 102	809	0	376	10	274	32
July	35	48+ 10 „ = 58	454	6	209	10	242	26
August	43	52+ 3 „ = 55	635	0	327	14	252	65
September ...	35	42+ 4 „ = 46	464	14	229	4	457	251
October ...	50	71+ 10 „ = 81	933	0	486	12	675	299
November ...	27	30+ 3 „ = 33	456	0	248	14	884	242
December ...	9	14+ 8 „ = 22	216	2	123	6	975	113
Total ...	312	1,595+217 blind = 1,812	20,214	2	11,540	7	—	1,337

Appendix IIIc.

OIL PALMS, NJALA, 1930.

COMPARATIVE YIELD OF TREES IN THE PLANTATION.

Yield in lb. of fruit.		0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100	100–110	110–120	120–130	130–140	Total number of trees in the plot in bearing.
Actual plot figures.	A	21	30	20	30	26	5	8	1	1	1	—	—	—	—	143
	B	10	10	25	20	25	27	18	10	4	2	—	1	—	1	153
	C	1	4	3	2	1	1	3	—	—	—	—	—	—	—	15
	D	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
	Total (Whole plot) ...	32	44	48	52	52	34	29	11	5	3	—	1	—	1	312
Percentage of total number of bearing trees in the plot.	A	14·7	21·0	14·0	21·0	18·2	3·6	5·6	0·7	0·7	0·7	—	—	—	—	
	B	6·5	6·5	16·3	13·1	16·3	17·6	11·8	6·5	2·6	1·3	—	0·7	—	0·7	
	Whole Plantation ...	10·3	14·1	15·4	16·7	16·7	10·9	9·3	3·5	1·6	1·0	—	0·3	—	0·3	

NOTE—Five A and five B trees did not bear fruit in 1930 and are not included above. One B tree (III/7) which bore fruit in 1930, died in May. Its yield is included above.

Appendix IIID.

OIL PALMS, NJALA, 1930.

COMPARISON OF TOTAL YIELD OF FRUIT OF INDIVIDUAL TREES IN THE PLANTATION FOR THE FIVE YEARS, 1926–1930.

Yeild in lb. of fruit.	0–50	50–100	100–150	150–200	200–250	250–300	300–350	350–400	400–450	450–500	Total number of trees in the plot bearing.
A	16	21	43	33	28	6	1	—	—	—	148
B	7	10	20	54	21	25	15	3	2	1	158
C	1	2	4	4	4	—	—	—	—	—	15
D	—	—	—	—	1	—	—	—	—	—	1
Total	24	33	67	91	54	31	16	3	2	1	322

Number of trees not yet bearing thirteen.

Appendix IIIe.

OIL PALMS, NJALA, 1930.

	Average Weight, Head. lb.	oz.	Average Weight, Fruit per Head lb.	oz.	Percentage of Fruit in Head.
January—A ...	14	6	6	15	48·8
B ...	14	9	9	7	64·8
Whole plot ...	14	6	9	1	55·9
February—A ...	10	3	4	13	47·0
B ...	14	14	9	1	65·4
Whole plot ...	12	13	7	9	58·9
March—A ...	10	7	5	8	52·6
B ...	14	0	9	3	65·9
Whole plot ...	12	3	7	4	59·7
April—A ...	11	10	6	2	56·5
B ...	14	2	9	8	67·3
Whole plot ...	12	14	7	14	61·2
May—A	12	13	6	9	51·1
B	15	10	10	0	64·0
Whole plot ...	14	0	7	4	55·0
June—A	10	8	4	9	43·5
B	8	15	4	8	50·1
Whole plot ...	9	10	4	8	46·6
July—A	9	11	3	13	39·4
B	9	13	5	1	51·5
Whole plot ...	9	7	4	6	46·1
August—A ...	9	14	4	13	48·5
B ...	13	12	7	5	53·3
Whole plot ...	12	5	6	5	51·6
September—A ...	8	13	3	8	40·0
B ...	12	11	7	2	56·0
Whole plot ...	11	1	5	7	49·3
October—A ...	11	8	5	6	46·7
B ...	16	4	9	12	60·1
Whole plot ...	13	2	6	14	52·2
November—A ...	13	0	6	2	47·2
B ...	19	10	12	10	64·4
Whole plot ...	15	3	8	5	54·6
December—A ...	15	7	8	2	52·7
B ...	15	7	9	3	59·5
Whole plot ..	15	7	8	13	57·1

Appendix III$_F$.

OIL PALMS, NJALA, 1930.

	Average Yield of Fruit per Tree.				Average Yield of Fruit per Acre (at 75 trees per acre).	
	A (Number of trees fruiting, 143)		B (Number of trees fruiting, 153)		A	B
	lb.	oz.	lb	oz.	lb.	lb.
January ...	1	14	2	11	141	202
February ...	2	12	6	12	206	506
March ...	7	11	10	15	577	820
April ...	6	10	9	11	497	727
May ...	5	10	7	3	422	539
June ...	1	2	1	6	84	103
July ...	0	8	0	14	38	66
August ..	0	10	1	9	47	117
September ...	0	8	0	15	38	70
October ...	1	10	1	9	122	117
November ...	0	14	0	13	66	61
December ...	0	5	0	9	23	42
Whole year	30	1	44	14	2,261	3,370

Average yield over all of fruit per fruiting tree, 37 lb. (Number of trees fruiting, 312).

Average yield over all of fruit per acre (at 75 trees per acre), 2,775 lb.

Appendix IIIG.

OIL PALMS, NJALA, 1930.

Number of Male Inflorescences at Anthesis in Different Months.

	Number on trees at end of month.	Number of dead inflorescences removed during month.	Number coming into flower during month (by difference).
January	142	499	488
February	122	325	305
March	56	267	18
April	38	123	105
May	27	95	84
June	5	56	24
July	12	10	17
August	43	17	48
September ...	177	130	264
October	256	624	703
November	442	579	765
December	476	610	644
Total number of male inflorescences produced in 1930 ...			3,465

PROPORTION OF MALE TO FEMALE INFLORESCENCES AT ANTHESIS.

January	7·7
February	5·3
March	0·4
April	1·4
May	1·2
June	0·8
July	0·7
August	0·7
September	1·1
October	2·4
November	3·2
December	5·7
Whole year	2·6

Appendix IV.

PLANTING MATERIAL AVAILABLE.

Abroma augusta. F.
Achras sapota, Sapodilla. E.
Agave rigida, Sisal. F.V.
Albizzia Sassa. N.S.
Albizzia zygia. N.S.
Alchornea cordifolia, Christmas bush. N.
Allamanda sp. O.V.
Amaralia bignoniaeflora. N.O.
Amaranthus caudatus, Bush greens, Spinach. E.
Anacardium occidentale, Cashew-nut. E.
Ananas sativus, Pineapple. E.V.
Anisophyllea laurina, Monkey apple. T.E.
Anona muricata, Soursop. E.
Anona squamosa, Sweetsop. E.
Anthocleista Frezoulsii, Cabbage "palm." N.O.
Anthocleista nobilis. N.O.
Antigonon Leptopus, Corallita. O.
Arachis hypogaea, Ground-nut. E.
Aralia sp., Angelica. O.
Aristolochia 2 spp. O.
Artocarpus incisa, Breadfruit. E.V.
,, ,, var., "Breadnut." E.
,, *integrifolia,* Jakfruit. E.
,, *odoratissima,* Johore Jak. E.
Axonopus compressus, Yani grass, Sierra Leone lawn grass. N.
Bambusa sp., Bamboo. N.
Bauhinia sp. (white-flowered). O.
Bauhinia sp. (yellow-flowered). O.
Berlinia auriculata. N.T.O.
Berlinia Heudelotiana. N.T.O.
Bonamia cymosa. N.O.
Bougainvillea sp. O.
Bryophyllum pinnatum. V.
Caesalpinia pulcherrima, Barbados pride. O.
Cajanus Cajan (C. indicus), Pigeon Pea. C.
Caladium bicolor. O.M.
Calopogonium mucunoides. C.
Caloncoba (Oncoba) *echinata.* N.
Canavalia ensiformis, Sword bean. E.

Canna indica. O.M.
Capsicum sp. Chillie paper. E.
Carica Papaya, Pawpaw. E.
Caryota urens. Toddy palm. O.
Cassia occidentalis, Stink week. N.
,, *siamea.* S.
,, *Sieberiana.* N.O.
Cathormion altissimum. N.
Cathormion Dinklagei. N.
Cedrela odorata, West Indian cedar.
Ceratotheca sesamoides. E.
Chrysophyllum Cainito, Star apple. E.
Cinnamomum zeylanicum, Cinnamon.
Citrullus vulgaris, Egusi. E.
Citrus aurantium, Sweet Orange. E.
,, ,, var. Satsuma Orange. E.V.
,, ,, var. Mandarin Orange. E.
,, ,, var. Washington Naval Orange. E.V
,, ,, var. Tangerine. E.
,, ,, var. St. Michael Orange. E.V.
,, ,, var. Sour Orange. E.
,, *acida,* var. Sierra Leone Lime. E.
,, ,, var. Dominica Lime. E.
,, *grandis,* Grapefruit. E.V. (vars Marsh Seedless, Forester, Royal, Thompson's, Walters, McCarty .
,, *Limetta,* Sweet Lime. E.
,, *Limonum,* Common Lemon. E.
,, ,, Rough Lemon. E.
,, ,, Genoa Lemon. E.V.
,, *Medica,* Citron. E.V.
Clerodendron scandens. N.O.
Clitoria Ternatea. O.
Cocos nucifera. Coco-nut palm. E.
Codiaeum spp. Crotons. O.M.
Coffea arabica, Coffee. E.
,, *liberica,* Coffee. E.
,, *robusta,* Coffee. E.
,, *stenophylla,* Coffee. E.N.
Coix lachryma-Jobi, Job's tears. N.
Cola lateritia. N.
,, *nitida,* Kola. N.E.
Colocasia Antiquorum, Coco-yam. E.V.
Combretum comosum. N.O.V.
,, *platypterum.* N.O.V.
Corchorus olitorius, Spinach. E.
Cosmos sulphureus. O.
Crotalaria sp. C.
Cymbopogon sp., Citronella grass.
Cynodon Dactylon, Bermuda or Dhub grass.

Desmodium adscendens. N.
,, *lasiocarpum.* N.
,, *mauritianum.* N.
,, (Meibomia) *purpureum.* C.
,, *triflorum.* N.
Dialium guineense, Black Tumbler or Velvet Tamarind. N.E.
Dichapetalum toxicarium, Ratsbane. N.
Dichrostachys glomerata. N.
Dioscorea bulbifera. N.V.
,, *cayennensis,* Yellow yam. E.V.
,, *esculentus,* Chinese yam. E.V.
,, *hirtiflora.* N.V.
,, *rotundata,* White yam. E.V.
,, sp., N.V.
Dissotis grandiflora. N.
,, *paucistellata.* N.
Dracaena spp., O.V.
Drypetes Afzelii, N.
Duranta Plumieri. O.
Elaeis guineensis, Oil-palm. N.E.M.
Enterolobium (Pithecolobium) *Saman,* Rain tree or Saman. S.
Eugenia Jambos, Roseapple. E.
Eugenia Michelii, Pitanga cherry. E.
Funtumia africana. N.
,, *elastica,* Funtumia rubber. N.
Furcraea gigantea, Mauritius hemp. F.V.
Gliricidia maculata. S.
Gloriosa superba. N.O.
Gmelina arborea. O.
,, *hystrix.* O.V.
Gomphrena globosa, Bachelor's Button. O.
Gossypium spp., Cotton. M.
Gouania longipetala. N.
Haronga paniculata. N.
Hevea brasiliensis, Para rubber.
Hibiscus esculentus, Okro. E.
,, *Sabdariffa,* Roselle. E.
,, *Rosa-sinensis.* O.V.
Hippeastrum equestre, Red lily. O.V.
Honckenya ficifolia. N.F.
,, *minor.* N.
Indigofera macrophylla. N.
,, *suffruticosa.* N.D.
,, *Heudelotii.* N.
Ipomoea Batatas, Sweet potato. E.V.
,, *rubro-coeruleum,* Morning Glory. O.V.
,, *Bona-nox* (Calonyction aculeatum), Moon flower. O.V.

Ipomoea Batatas, Sweet potato. E.V.
Ixora coccinea. O.V.
Jatropha Curcas, Physic-nut. O.
,, *gossypifolium*, Fig-nut flower. O.
,, *multifida*. O.
,, *podagrica*. O.
Lagenaria vulgaris, Calabash gourd.
Lissochilus purpuratus, Purple orchid. N.O.
Lochnera rosea, Periwinkle. O.
Lonchocarpus cyanescens, Gara dye (blue). N.D.V.
Lonicera sp., Honeysuckle. O.V.
Luffa cylindrica, Loofah. N.
Macaranga Barteri. N.B.
,, *Heudelotii*. N.B.
,, *huraefolia*. N.B.
Mangifera indica, Mango. E.
Manihot Aipi (M. palmata), Sweet cassava. E.V.
,, *utilissima*, Bitter cassava. E.V.
Maranta arundinacea, Arrowroot. E.
Melia Azederach, Persian lilac, Nim. O.
Monopetalanthus pteridophyllum. N.
Mucuna pruriens, Bengal bean. C.
Musa paradisiaca, Plantain. E.V.
,, *Sapientum*, Banana. E.V.M.
Musanga Smithii, Cork wood. N.
Mussaenda Afzelii. N.
,, *elegans*. N.O.
Napoleona Vogelii. N.
Newbouldia laevis. N.O.V.
Nicotiana Tabacum. Tobacco.
,, *rustica*. Tobacco.
Oryza Barthii, True wild rice. N.E.
,, *sativa*, Rice, many kinds. E.M.
Pachira insignis. O.
Pachystela micrantha. N.
Panax sp. O.V.
Pandanus sp. O.
Parinarium excelsum, Rough-skinned plum. N.E.
Paspalum conjugatum. N.
Paspalum scrobiculatum. N.
Peltophorum africanum, var. *speciosum*. O.
Pennisetum gracile. N.
,, *typhoideum*, Bulrush millet. E.
Persea gratissima, Avocado "pear." E.
Phaseolus lunatus, Lima bean. E.
Phyllanthus discoideus. N.B.
,, *Wildemannii*. N.
Physalis peruviana, Cape gooseberry. E.
Piptadenia africana. N.O.

Plumeria acutiflora, Frangipani. O.V.
,, *rubra*. O.V.
Poinciana regia, Flamboyante. O.
Psidium Guajava, Guava. E.
Pterocarpus santalinoides. N.
Rauwolfia vomitoria, Swizzle stick tree. N.
Ricinus communis, Castor oil. M.
Rottboellia exaltata. N.
Saccharum officinarum, Sugar cane. V.
,, ,, var., Uba cane. V.
Sarcocephalus esculentus, Sierra Leone peach. N.E.
Scytopetalum Tieghamii. N.
Sesamum radiatum. E.
,, *indicum*, Beniseed, Gingelly, Simsim. E.
Setaria Chevalieri, (S. sulcata). N.
Solanum anomalum. E.
,, *macrocarpon*. E.
,, *nodiflorum*, (cultivated var.) Bologi. E.
Sorghum margaritiferum, Sierra Leone guinea corn. E.
Sorindeia juglandifolia, "Damson." N.E.
,, spec., nov. near *trimera*. N.E.
Tamarindus indica, Tamarind. E.
Tectona grandis, Teak. T.
Tephrosia candida. C.
Terminalia Catappa, "Almond." E.
Tetracera potatoria. N.V.
Theobroma Cacao, Cacao. E.
Thevetia neriifolia, Lucky bean. O.
Thunbergia alata. O.
,, *erecta*. O.V.
,, *grandiflora*. O.V.
Trema guineensis. N.
Tricalysia triloculare. N.
Vernonia conferta. N.
Vetiveria zizanoides. V.
Vigna unguiculata (V. sinensis, V. Catjang), Cowpea. E.
Vitex micrantha. N.
Voandzeia subterranea, Bambara ground-nut. E.
Zingiber officinalis, Ginger. E.

Explanation :—

B, yields firewood.
C, culture plant.
D, dye-yielding.
E, fruit-bearing or edible.
F, fibre-yielding.
M, more than one kind available.
N, indigenous.
O, ornamental.
S, shade.
T, timber-yielding.
V, vegetative parts only.